the OIL AND GAS JOURNAL

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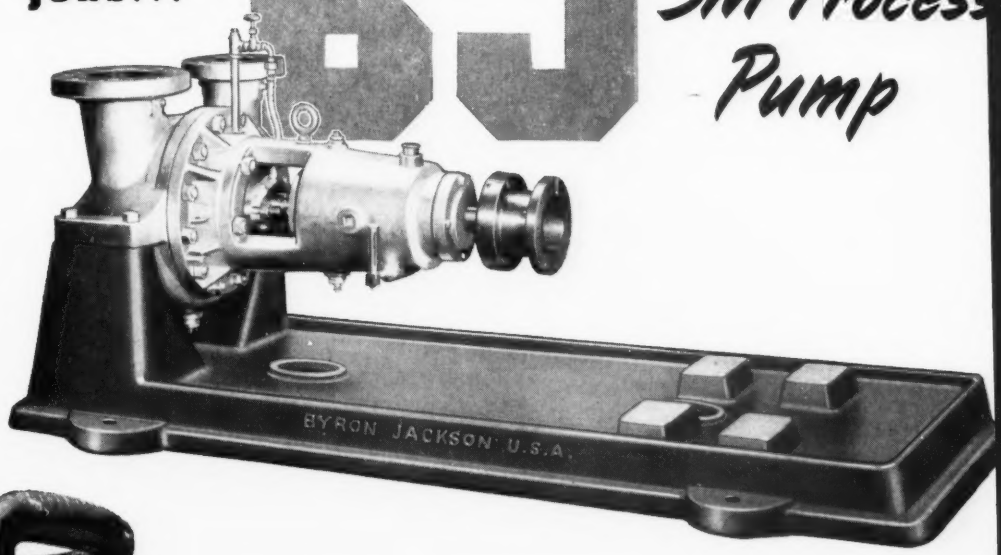
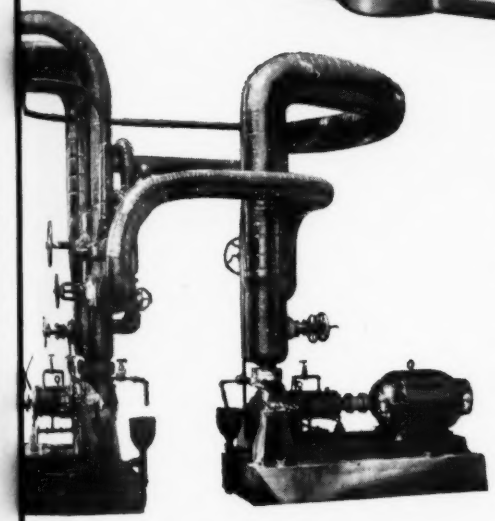
For *Hot* jobs... BJ *SM Process Pump*





Two SM Process Pumps, installed by Refinery Engineering Co. Two-stage turbine-driven pump (left) operates against a 775 foot head, motor driven pump (right) against a 530 foot head. Pumping 28° API reduced crude at 500° F

Hot, inflammable liquids . . . pumped under high pressures and at temperatures well above the flash point. Cold, boiling liquids . . . pumped from vacuum vessels. These and other pump problems are encountered in those industries whose products are processed in liquid form.

BJ Type SM Process Pumps are accepted as the safest and most efficient pumps used by processors for the "Hot" jobs. This is as it should be. For BJ is the leader in the development of centrifugal pumps for the process industries. *Capacities:* 40 to 1200 gpm; *Heads:* 25 to 1000 feet.

Write for Bulletin 46-7050. Address Dept. 164, Byron Jackson Co., Box 2017 Terminal Annex, Los Angeles 54.

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51 PORTER "REFINERS"

SPEED BLENDING AT GULF'S PHILADELPHIA REFINERY

PORTER "Better Built" MIXERS

Gulf Oil Corporation has chosen "The Refiner" —Porter's precision-built side-entering mixer— for its blending operations at Philadelphia. Fifty-one of these mixers have already been installed in 22 tanks ranging from 80 to 120 feet in diameter.

Originally developed for mixing liquids of the lowest viscosity, "The Refiner" has proved a remarkably reliable and efficient mixer for *all* liquids, including lube oils, gas oils, and ethyl gasolines. Equipped with the exclusive Porter Self-Sealing Shaft, "The Refiner" can easily and quickly be repacked without draining the tank— a time and money saving feature.

There is a Porter Engineer in your vicinity who will be glad to discuss how you can modernize your mixing and blending operations with Porter "Better-Built" Mixers.

PORTER Better Built Equipment Established 1866

PORTER BUILT means "Better Built"

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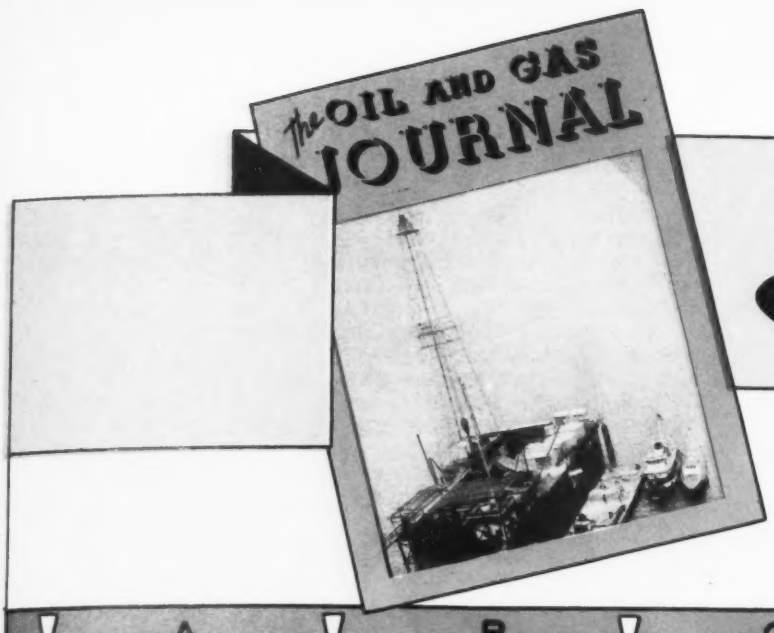

Journal-

Supplement to The Oil and Gas Journal
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A B C D E

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LEGEND

OIL FIELD

GAS FIELD

SALT DOME

REFINERY

INTERCOASTAL CANAL SYSTEMS

DREDGED OR MAINTAINED.

AUTHORIZED BUT NOT COMPLETED.

SCALE IN MILES

10 5 0 10 20 30 40 50

GILLESPIE
FREDERICKSBURG
BLANCO
JOHNSON CITY
TRAVIS
AUSTIN
MANDA
KIMBRO
HAYS
KERR
KERRVILLE
KENDALL
COMAL
BOERNE
NEW BRAUNFELS
SAN MARCOS
LOCKHART
S.DALE
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W. DALE
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CEDAR CR.
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SCHIMMEL
LENTZ
BUCHANAN
LULING-BRANYON
TENNEY CR.
ELLISON-YOUNG
BARTLETT WELLS
SALT FLAT
BOB ROSE
LULING
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MANFORD
DUNLAP
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HOPE VILLA
MALLOT BLUFF
GULF PORT
BAY ST. LOUIS
BIG POINT
Lake Maurepas
Lake Pontchartrain
SORRENTO
DARROW
ST JOHN THE BAPTIST
RESERVE
LA PLACE
UNKNOWN PASS
ORLEANS
COLLEGE PT.
HESTER
LAPICE
VACHERIE
GOOD HOPE
Lake Borgne
ST JAMES
ST CHARLES
HAHNVILLE
NEW ORLEANS
KENILWORTH
ST BERNARD
WESTWEGO
PARADIS
BAY COUBA
Lake Salvador
STELLA
CHACAHOULA
BAY DES ALLEMANDS
RACELAND
LA FOURCHE CROSSING
BARATARIA
BAYOU DE FLEUR
DELACROIX
Breton Sound
BAYOU PEROT
ALLIANCE
VALENTINE
DELTA FARMS
LITTLE TEMPLE
LA FITTE
LAKE HERMITAGE
POTASH
LAFOURCHE
N. GIBSON
GIBSON
HOUMA
LAKE LONG
S. HOUMA
BULLY CAMP
QUARANTINE BAY
BAYOU PENCHANT
TERREBONNE
LIRETTE
BAY BAPTISTE
BAY DE CHENE
Barataria Bay
WASHINGTON
GRAND BAY
DELARGE
GOLDEN MEADOWS
BASTION BAY
DELTA DUCK CLUB
LAPEYROUSE
QUEEN BESS IS.
FOUR ISLE
Lake Barre
VENICE
WEST BAY
LEEVILLE
DOG LAKE
LAKE BARRE
Timbalier Bay
CAILLOU IS.
BAY ST. ELAINE
Terrebonne Bay
BAY MARCHAND
GARDEN ISLAND BAY
Caillou Bay
LAKE PELTO
TIMBALIER BAY

XICO

WILSON
FLORESVILLE
POTH
SOMERSET
ADAMS
DEVINE
FALLS CITY
Railroad Comm. District
CUERO
DE WIT
YORKTOWN
COTTONWOOD CREEK
FRIOTOWN
SCHATTEL
FRIO
PEARSALL
PEARSALL TOWNSITE
PEARSALL
CHARLOTTE
MOGENE
JOURDANTON
ATASCOSA
HOBSON
HYSAW
KARNES
KARNES CITY
RUNGE
COG CITY
WARMLEY
NORDHEIM
MEYERSVILLE
WESER
S. WEESATCHE
WEIGANG
PORTER
MC CASKILL
WEESATCHE
BOYCE
N. GOLIAD
HONDO CR.
CABEZA CR.
POEHLER
GREEN
BELKNAP
ALBRECHT
S. CABEZA CR.
MAETZE
BURNELL
S. BURNELL
CAESER
HORDES CR.
W. GOLIAD
TULSITA
COSDEN
PETTUS
DIAL
GOLIAD
PICKETT
PLUMMER
RUTLEDGE
GRAYBURG
DIRKS
TULETA
N. JACOBS
MARBACK
OAKVILLE
JACOBS
MINERAL
GOEBEL
VOSS
COQUAT
W. TULETA
MC MURRAY
NORMANNA
GENEVIEVE
HOLTZMARK
THEIS
RAY
FOLEY
BERCLAIR
CROWTHER
CALLIHAN
THREE RIVERS
KITTIE
COTULLA
TILDEN
SARCO
GULF
O'CONNOR
S. CALLIHAM
SIMMONS
EZZELL
BEE
CADIZ
YOUGEEN
BLANCONA
S. BLANCONA
HYNES
FOX
LA SALLE
MC MULLEN
LIVE OAK
WASHBURN
S. WASHBURN
GREEN BRANCH
WENTZ
WHITE CR.
S. WHITE CR.
THOMSON RANCH
MEDIO CR.
REFUGIO
SAN COJA
FT. MERRILL
SLIVA
DINERO
TYNAN
MOUNTAIN VIEW
RHODE
CHAPA
WHITTINGTON
SCHWARTZ
LUCAS
LA ROSA
ROOKE
LOMA ALTA
CAMPANA
MC NEILL
BEASLEY
MUNSON
SAN JOSE
S. CAMPANA
SINTON
PLYMOUTH
PIEDRE LUMBRE
COUNTY LINE
HINNANT
MATHIS
WILLMANN
E. MATHIS
ADAMI
GORMAC
LOS PICACHOS
SEVEN SISTERS
LABBE
SANDIA
MAEDGON
S. SINTON
TAFT
CHARAMOUSCA
CASA BLANCA
S. SEVEN SISTERS
N. KREIS
PENA
WADE
GALLAGHER
ROUND LAKE
SAN PATRICIO
GOVT WELLS
LOMA VISTA
CHILTIPIN
STRAUB
AMARGOSA
ORANGE GROVE
DOUGHERTY
O'NEIL
ODEM
MIDWAY
ARANSAS PASS
LUNDELL
LOMA NOVIA
HERBST
KREIS
FITZSIMMONS
JIM WELLS
SPRINGFIELD
ALFRED
BROWNLEE
RICHARD KING
REYNOLDS
E. RIVERSIDE
ANGELITA
WHITE POINT
E. WHITE POINT
GREGORY
HIRSCH
COLMENA
CEDRO HILL
ROSITA
TARANCAHUAS
THOMAS
LOCKHART
AGUA PRIETA
CAMADA
BENTONVILLE
N. MINNIE BOCK
TURKEY CR.
MOCA
SARNOSA
HOFFMAN
E. PETERS
CAPT LUCY
ALICE
AGUA DULCE
ROBSTOWN
SAXET
CORPUS CHRISTI
LEASE HOLDERS
BRIDWELL
BLANCHARD
CADENA
E. ALICE
CLARK MUIL
HOWELL
MINNIE BOCK
BALDWIN
PETERS
S. HOFFMAN
TESORO
PALAGANA
KOOPMAN
BRAYTON
NUECES
SHIELD
LOPEZ
RANCHO SOLO
N. MAGNOLIA CITY
STRATTON
KOHLER
DUVAL
PIEDRAS PINTAS
WEBB
ROSALIA
MAGNOLIA CITY
LONDON
FLOUR BLUFF
CAROLINA TEXAS
DINN
SIMMS
CONOCO DRISCOLL
BEN BOLT
PETRONILLA (N. LUBY)
VOLPE
RICHARDSON
N. BENAVIDES
LUBY
CHAPMAN RANCH
NEIN
LAUREL
N. KILLAM
OILTON
E. COLE CAM
SOUTHLAND BENAVIDES
BANDERA
MONTE NEGRA
REISER
COLE
LONGHORN
BORREGAS
BIRD ISLAND
SEELIGSON
KINGSVILLE
STAGGS
PREMONT
KINGSVILLE
RETAMIAD
MIRANDO CITY
SCHOTT
EL MESQUITE
RIOS
TIJERINA-CANALES
KLEBERG
MC LEAN
HERN
MID O.JVELAS
VOM BLUCHER
SE ILTA
LOMA VALDEZ
LAS MUERES
ALBERCAS
LA GLORIA
E. CANALES
RIVIERA
HENNE-WINCH-FARRIS
HOLBEIN
YEAGER
WILSON
E. FALFURIAS
Baffin Bay
BLAS URIBE
MIRANDO VALLEY
TA FEIVE
ARMSTRONG
PALO BLANCO
DAN SULLIVAN
SARITA
GLEN
LAS ANIMAS
GYP HILL
LOMA BLANCA
MC GILL
CUELLAR
MARTINEZ
HOLLAND
PEYOTE
HEBBRONVILLE
WEIL
ALTA VERDE
MARIPOSA
MANILA
PATEL
RANDADO
ESCOBAS
JENNINGS
CAGE
PITA
JIM HOGG
BROOKS
4
Railroad Comm. Dist.
ZAPATA
VILLA ALWORTH
CHAPAROSA NEUHAUS
COMITAS
SCOTT & HOPPER
BOEDECKER
N. ALTA MESA
RACHAL
EAST
COLORADO
ALTA MESA
E. ALTA MESA
KENEDY
ZAPATA
ECHOLS
HARTMAN
CHARCO REDONDO
E. CHARCO REDONDO
DEEP KELSEY
JONES
KELSEY
RIO GRANDE
SACATOSA
GUERRA
SANTA ELENA
VILLA REAL
N. SUN
HOPENA
JAKALAK
SUN
LA REFORMA
LOS INDIOS
MC DERMOTT
STARR
N. RINCON
S. LA REFORMA
CAMERON
RINCON DE YZAQUINE
CHARCO BLANCO
LA SAL VIEJA
RAYMONDVILLE
MARGO
BARRACOSA
KENNARD
FROST
FLORES
YTURRIA
ZIM
RICARDY
ROMO
LOS OLMOS
HAYDEN
WILLACY
DOHLE
HIDALGO
RIO GRANDE CITY
BOYLE
GARCIA
CORTEZ
SAN SALVADOR
WILLAMAR
GRANDE
WOOD
SULLIVAN CITY
SANTO DOMINGO
N. SAM FORDYCE
SAM FORDYCE
NICHOLS
PENITAS
EDINBURG
LA BLANCA
MERCEDES
LACY
MC ALLEN
CAMERON
ALAMO
WESLACO
SANTA MARIA
LANDA
POINT ISABEL
BROWNSVILLE
Intracoastal Waterway (not Madre Lagoon)
Laguna
1
2
3
4
5
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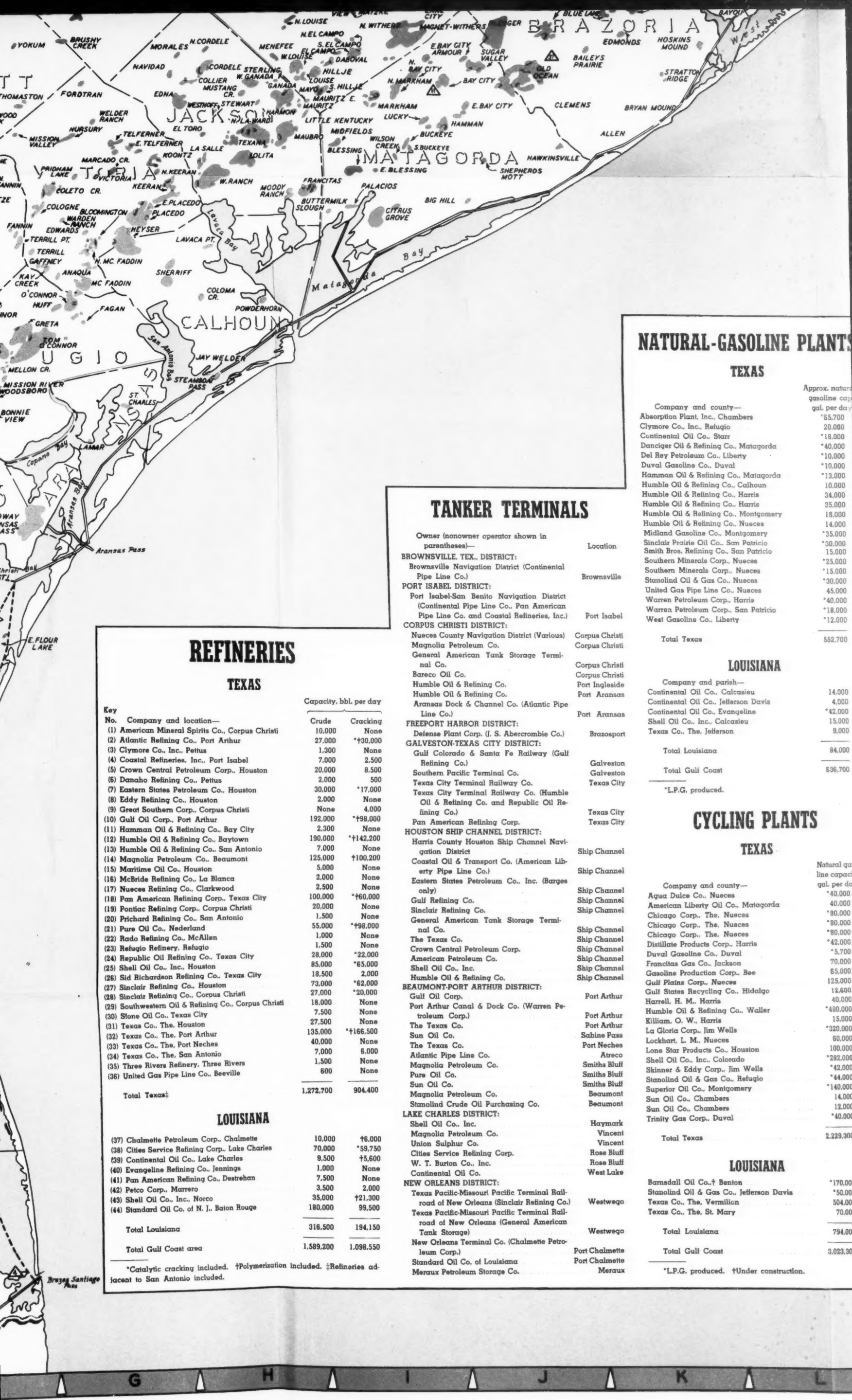
A
B
C
D
E
F



REFINERIES

TEXAS

Key No.	Company and location—	Capacity, bbl. per day: Crude	Cracking
(1)	American Mineral Spirits Co., Corpus Christi	10,000	None
(2)	Atlantic Refining Co., Port Arthur	27,000	*30,000
(3)	Clymore Co., Inc., Pettus	1,300	None
(4)	Coastal Refineries, Inc., Port Isabel	7,000	2,500
(5)	Crown Central Petroleum Corp., Houston	20,000	8,500
(6)	Danaho Refining Co., Pettus	2,000	500
(7)	Eastern States Petroleum Co., Houston	30,000	*17,000
(8)	Eddy Refining Co., Houston	2,000	None
(9)	Great Southern Corp., Corpus Christi	None	4,000
(10)	Gulf Oil Corp., Port Arthur	192,000	*98,000
(11)	Hamman Oil & Refining Co., Bay City	2,300	None
(12)	Humble Oil & Refining Co., Baytown	190,000	*142,200
(13)	Humble Oil & Refining Co., San Antonio	7,000	None
(14)	Magnolia Petroleum Co., Beaumont	125,000	†100,200
(15)	Maritime Oil Co., Houston	5,000	None
(16)	McBride Refining Co., La Blanca	2,000	None
(17)	Nueces Refining Co., Clarkwood	2,500	None
(18)	Pan American Refining Corp., Texas City	100,000	*†60,000
(19)	Pontiac Refining Corp., Corpus Christi	20,000	None
(20)	Prichard Refining Co., San Antonio	1,500	None
(21)	Pure Oil Co., Nederland	55,000	*†98,000
(22)	Rado Refining Co., McAllen	1,000	None
(23)	Refugio Refinery, Refugio	1,500	None
(24)	Republic Oil Refining Co., Texas City	28,000	*22,000
(25)	Shell Oil Co., Inc., Houston	85,000	*65,000
(26)	Sid Richardson Refining Co., Texas City	18,500	2,000
(27)	Sinclair Refining Co., Houston	73,000	*62,000
(28)	Sinclair Refining Co., Corpus Christi	27,000	*20,000
(29)	Southwestern Oil & Refining Co., Corpus Christi	18,000	None
(30)	Stone Oil Co., Texas City	7,500	None
(31)	Texas Co., The, Houston	27,500	None
(32)	Texas Co., The, Port Arthur	135,000	*†166,500
(33)	Texas Co., The, Port Neches	40,000	None
(34)	Texas Co., The, San Antonio	7,000	6,000
(35)	Three Rivers Refinery, Three Rivers	1,500	None
(36)	United Gas Pipe Line Co., Beeville	600	None
	Total Texas‡	1,272,700	904,400

LOUISIANA

(37)	Chalmette Petroleum Corp., Chalmette	10,000	†6,000
(38)	Cities Service Refining Corp., Lake Charles	70,000	*59,750
(39)	Continental Oil Co., Lake Charles	9,500	†5,600
(40)	Evangeline Refining Co., Jennings	1,000	None
(41)	Pan American Refining Co., Destrehan	7,500	None
(42)	Petco Corp., Marrero	3,500	2,000
(43)	Shell Oil Co., Inc., Norco	35,000	†21,300
(44)	Standard Oil Co. of N. J., Baton Rouge	180,000	99,500
	Total Louisiana	316,500	194,150
	Total Gulf Coast area	1,589,200	1,098,550

*Catalytic cracking included. †Polymerization included. ‡Refineries adjacent to San Antonio included.

TANKER TERMINALS

Owner (nonowner operator shown in parentheses)—	Location
BROWNSVILLE, TEX., DISTRICT:	
Brownsville Navigation District (Continental Pipe Line Co.)	Brownsville
PORT ISABEL DISTRICT:	
Port Isabel-San Benito Navigation District (Continental Pipe Line Co., Pan American Pipe Line Co. and Coastal Refineries, Inc.)	Port Isabel
CORPUS CHRISTI DISTRICT:	
Nueces County Navigation District (Various)	Corpus Christi
Magnolia Petroleum Co.	Corpus Christi
General American Tank Storage Terminal Co.	Corpus Christi
Bareco Oil Co.	Corpus Christi
Humble Oil & Refining Co.	Port Ingleside
Humble Oil & Refining Co.	Port Aransas
Aransas Dock & Channel Co. (Atlantic Pipe Line Co.)	Port Aransas
FREEPORT HARBOR DISTRICT:	
Defense Plant Corp. (J. S. Abercrombie Co.)	Brazosport
GALVESTON-TEXAS CITY DISTRICT:	
Gulf Colorado & Santa Fe Railway (Gulf Refining Co.)	Galveston
Southern Pacific Terminal Co.	Galveston
Texas City Terminal Railway Co.	Texas City
Texas City Terminal Railway Co. (Humble Oil & Refining Co. and Republic Oil Refining Co.)	Texas City
Pan American Refining Corp.	Texas City
HOUSTON SHIP CHANNEL DISTRICT:	
Harris County Houston Ship Channel Navigation District	Ship Channel
Coastal Oil & Transport Co. (American Liberty Pipe Line Co.)	Ship Channel
Eastern States Petroleum Co., Inc. (Barges only)	Ship Channel
Gulf Refining Co.	Ship Channel
Sinclair Refining Co.	Ship Channel
General American Tank Storage Terminal Co.	Ship Channel
The Texas Co.	Ship Channel
Crown Central Petroleum Corp.	Ship Channel
American Petroleum Co.	Ship Channel
Shell Oil Co., Inc.	Ship Channel
Humble Oil & Refining Co.	Ship Channel
BEAUMONT-PORT ARTHUR DISTRICT:	
Gulf Oil Corp.	Port Arthur
Port Arthur Canal & Dock Co. (Warren Petroleum Corp.)	Port Arthur
The Texas Co.	Port Arthur
Sun Oil Co.	Sabine Pass
The Texas Co.	Port Neches
Atlantic Pipe Line Co.	Atreco
Magnolia Petroleum Co.	Smiths Bluff
Pure Oil Co.	Smiths Bluff
Sun Oil Co.	Smiths Bluff
Magnolia Petroleum Co.	Beaumont
Stanolind Crude Oil Purchasing Co.	Beaumont
LAKE CHARLES DISTRICT:	
Shell Oil Co., Inc.	Haymark
Magnolia Petroleum Co.	Vincent
Union Sulphur Co.	Vincent
Cities Service Refining Corp.	Rose Bluff
W. T. Burton Co., Inc.	Rose Bluff
Continental Oil Co.	West Lake
NEW ORLEANS DISTRICT:	
Texas Pacific-Missouri Pacific Terminal Railroad of New Orleans (Sinclair Refining Co.)	Westwego
Texas Pacific-Missouri Pacific Terminal Railroad of New Orleans (General American Tank Storage)	Westwego
New Orleans Terminal Co. (Chalmette Petroleum Corp.)	Port Chalmette
Standard Oil Co. of Louisiana	Port Chalmette
Meraux Petroleum Storage Co.	Meraux

NATURAL-GASOLINE PLANTS

TEXAS

Company and county—	Approx. natural gasoline capacity, gal. per day
Absorption Plant, Inc., Chambers	*65,700
Clymore Co., Inc., Refugio	20,000
Continental Oil Co., Starr	*18,000
Danciger Oil & Refining Co., Matagorda	*40,000
Del Rey Petroleum Co., Liberty	*10,000
Duval Gasoline Co., Duval	*10,000
Hamman Oil & Refining Co., Matagorda	*13,000
Humble Oil & Refining Co., Calhoun	10,000
Humble Oil & Refining Co., Harris	34,000
Humble Oil & Refining Co., Harris	35,000
Humble Oil & Refining Co., Montgomery	18,000
Humble Oil & Refining Co., Nueces	14,000
Midland Gasoline Co., Montgomery	*35,000
Sinclair Prairie Oil Co., San Patricio	*30,000
Smith Bros. Refining Co., San Patricio	15,000
Southern Minerals Corp., Nueces	*25,000
Southern Minerals Corp., Nueces	*15,000
Stanolind Oil & Gas Co., Nueces	*30,000
United Gas Pipe Line Co., Nueces	45,000
Warren Petroleum Corp., Harris	*40,000
Warren Petroleum Corp., San Patricio	*18,000
West Gasoline Co., Liberty	*12,000
Total Texas	552,700

LOUISIANA

Company and parish—	
Continental Oil Co., Calcasieu	14,000
Continental Oil Co., Jefferson Davis	4,000
Continental Oil Co., Evangeline	*42,000
Shell Oil Co., Inc., Calcasieu	15,000
Texas Co., The, Jefferson	9,000
Total Louisiana	84,000
Total Gulf Coast	636,700

*L.P.G. produced.

CYCLING PLANTS

TEXAS

Company and county—	Natural gasoline capacity, gal. per day
Agua Dulce Co., Nueces	*40,000
American Liberty Oil Co., Matagorda	40,000
Chicago Corp., The, Nueces	*80,000
Chicago Corp., The, Nueces	*80,000
Chicago Corp., The, Nueces	*80,000
Distillate Products Corp., Harris	*42,000
Duval Gasoline Co., Duval	*5,700
Francitas Gas Co., Jackson	70,000
Gasoline Production Corp., Bee	65,000
Gulf Plains Corp., Nueces	125,000
Gulf States Recycling Co., Hidalgo	12,600
Harrell, H. M., Harris	40,000
Humble Oil & Refining Co., Waller	*480,000
Killiam, O. W., Harris	15,000
La Gloria Corp., Jim Wells	*320,000
Lockhart, L. M., Nueces	60,000
Lone Star Products Co., Houston	100,000
Shell Oil Co., Inc., Colorado	*282,000
Skinner & Eddy Corp., Jim Wells	*42,000
Stanolind Oil & Gas Co., Refugio	*44,000
Superior Oil Co., Montgomery	*140,000
Sun Oil Co., Chambers	14,000
Sun Oil Co., Chambers	12,000
Trinity Gas Corp., Duval	*40,000
Total Texas	2,229,300

LOUISIANA

Barnsdall Oil Co.,† Benton	*170,000
Stanolind Oil & Gas Co., Jefferson Davis	*50,000
Texas Co., The, Vermilion	504,000
Texas Co., The, St. Mary	70,000
Total Louisiana	794,000
Total Gulf Coast	3,023,300

*L.P.G. produced. †Under construction.

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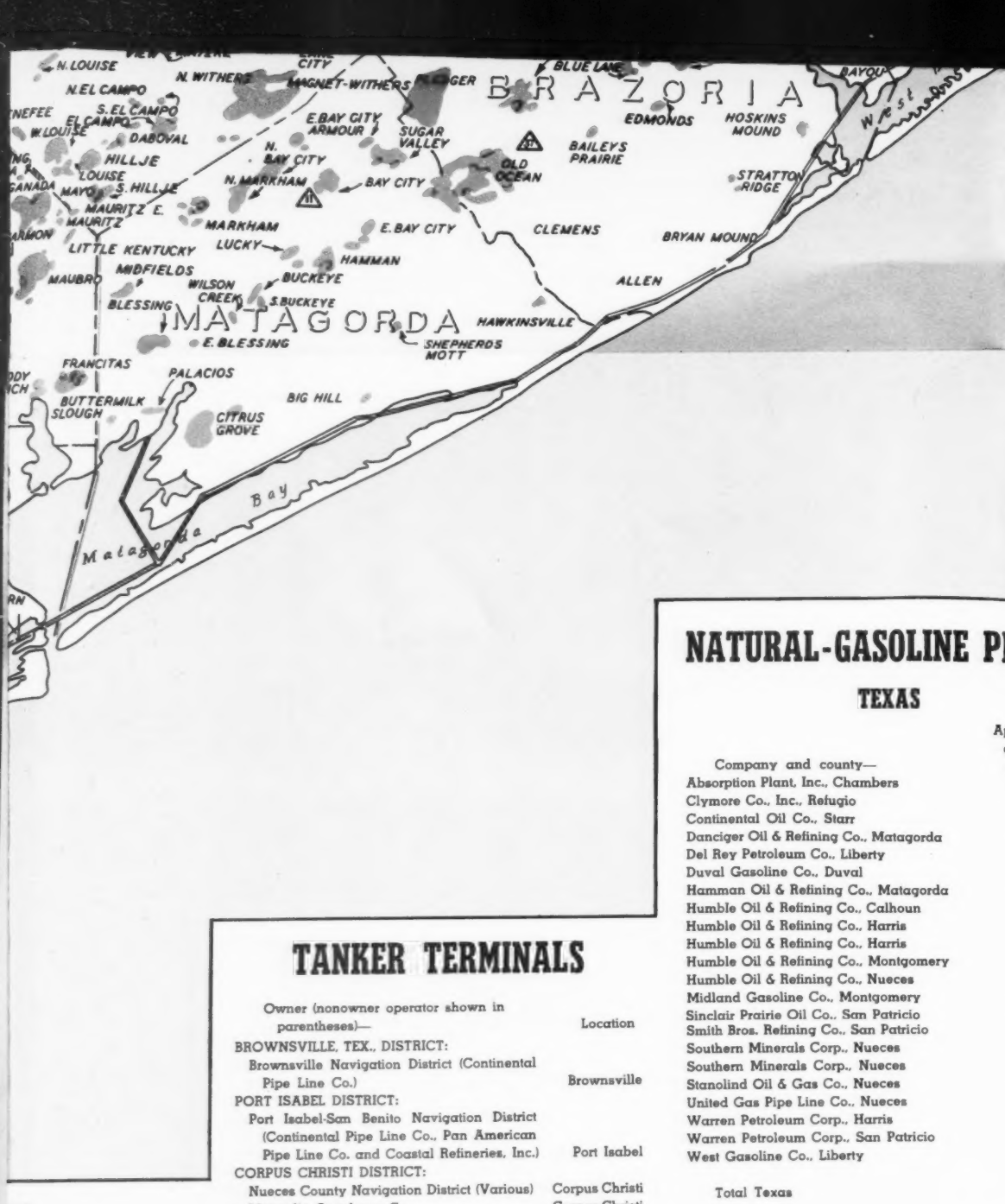

NATURAL-GASOLINE PLANTS

TEXAS

Company and county—	Approx. natural gasoline cap., gal. per day
Absorption Plant, Inc., Chambers	*65,700
Clymore Co., Inc., Refugio	20,000
Continental Oil Co., Starr	*18,000
Danciger Oil & Refining Co., Matagorda	*40,000
Del Rey Petroleum Co., Liberty	*10,000
Duval Gasoline Co., Duval	*10,000
Hamman Oil & Refining Co., Matagorda	*13,000
Humble Oil & Refining Co., Calhoun	10,000
Humble Oil & Refining Co., Harris	34,000
Humble Oil & Refining Co., Harris	35,000
Humble Oil & Refining Co., Montgomery	18,000
Humble Oil & Refining Co., Nueces	14,000
Midland Gasoline Co., Montgomery	*35,000
Sinclair Prairie Oil Co., San Patricio	*30,000
Smith Bros. Refining Co., San Patricio	15,000
Southern Minerals Corp., Nueces	*25,000
Southern Minerals Corp., Nueces	*15,000
Stanolind Oil & Gas Co., Nueces	*30,000
United Gas Pipe Line Co., Nueces	45,000
Warren Petroleum Corp., Harris	*40,000
Warren Petroleum Corp., San Patricio	*18,000
West Gasoline Co., Liberty	*12,000
Total Texas	552,700

LOUISIANA

Company and parish—	
Continental Oil Co., Calcasieu	14,000
Continental Oil Co., Jefferson Davis	4,000
Continental Oil Co., Evangeline	*42,000
Shell Oil Co., Inc., Calcasieu	15,000
Texas Co., The, Jefferson	9,000
Total Louisiana	84,000
Total Gulf Coast	636,700

*L.P.G. produced.

CYCLING PLANTS

TEXAS

Company and county—	Natural gasoline capacity, gal. per day
Aqua Dulce Co., Nueces	*40,000
American Liberty Oil Co., Matagorda	40,000
Chicago Corp., The, Nueces	*80,000
Chicago Corp., The, Nueces	*80,000
Chicago Corp., The, Nueces	*80,000
Distillate Products Corp., Harris	*42,000
Duval Gasoline Co., Duval	*5,700
Francitas Gas Co., Jackson	70,000
Gasoline Production Corp., Bee	55,000
Gulf Plains Corp., Nueces	125,000
Gulf States Recycling Co., Hidalgo	12,600
Harrell, H. M., Harris	40,000
Humble Oil & Refining Co., Waller	*480,000
Killiam, O. W., Harris	15,000
La Gloria Corp., Jim Wells	*320,000
Lockhart, L. M., Nueces	60,000
Lone Star Products Co., Houston	100,000
Shell Oil Co., Inc., Colorado	*282,000
Skinner & Eddy Corp., Jim Wells	*42,000
Stanolind Oil & Gas Co., Refugio	*44,000
Superior Oil Co., Montgomery	*140,000
Sun Oil Co., Chambers	14,000
Sun Oil Co., Chambers	12,000
Trinity Gas Corp., Duval	*40,000
Total Texas	2,229,300

LOUISIANA

Barnsdall Oil Co.,† Benton	*170,000
Stanolind Oil & Gas Co., Jefferson Davis	*50,000
Texas Co., The, Vermilion	504,000
Texas Co., The, St. Mary	70,000
Total Louisiana	794,000
Total Gulf Coast	3,023,300

*L.P.G. produced. †Under construction.

TANKER TERMINALS

Owner (nonowner operator shown in parentheses)—	Location	Capacity, bbl. per day: Crude	Cracking
BROWNSVILLE, TEX., DISTRICT:			
Brownsville Navigation District (Continental Pipe Line Co.)	Brownsville	10,000	None
PORT ISABEL DISTRICT:			
Port Isabel-San Benito Navigation District (Continental Pipe Line Co., Pan American Pipe Line Co. and Coastal Refineries, Inc.)	Port Isabel	27,000	*†30,000
CORPUS CHRISTI DISTRICT:			
Nueces County Navigation District (Various)	Corpus Christi	1,300	None
Magnolia Petroleum Co.	Corpus Christi	7,000	2,500
General American Tank Storage Terminal Co.	Corpus Christi	20,000	8,500
Bareco Oil Co.	Corpus Christi	2,000	500
Humble Oil & Refining Co.	Port Ingleside	30,000	*17,000
Humble Oil & Refining Co.	Port Aransas	2,000	None
Aransas Dock & Channel Co. (Atlantic Pipe Line Co.)	Port Aransas	None	4,000
FREEPORT HARBOR DISTRICT:		192,000	*†98,000
Defense Plant Corp. (J. S. Abercrombie Co.)	Brazosport	2,300	None
GALVESTON-TEXAS CITY DISTRICT:		190,000	*†142,200
Gulf Colorado & Santa Fe Railway (Gulf Refining Co.)	Galveston	7,000	None
Southern Pacific Terminal Co.	Galveston	125,000	†100,200
Texas City Terminal Railway Co.	Texas City	5,000	None
Texas City Terminal Railway Co. (Humble Oil & Refining Co. and Republic Oil Refining Co.)	Texas City	2,000	None
Pan American Refining Corp.	Texas City	2,500	None
HOUSTON SHIP CHANNEL DISTRICT:		100,000	*†60,000
Harris County Houston Ship Channel Navigation District	Ship Channel	20,000	None
Coastal Oil & Transport Co. (American Liberty Pipe Line Co.)	Ship Channel	1,500	None
Eastern States Petroleum Co., Inc. (Barges only)	Ship Channel	55,000	*†98,000
Gulf Refining Co.	Ship Channel	1,000	None
Sinclair Refining Co.	Ship Channel	1,500	None
General American Tank Storage Terminal Co.	Ship Channel	28,000	*22,000
The Texas Co.	Ship Channel	85,000	*65,000
Crown Central Petroleum Corp.	Ship Channel	18,500	2,000
American Petroleum Co.	Ship Channel	73,000	*62,000
Shell Oil Co., Inc.	Ship Channel	27,000	*20,000
Humble Oil & Refining Co.	Ship Channel	18,000	None
BEAUMONT-PORT ARTHUR DISTRICT:		7,500	None
Gulf Oil Corp.	Port Arthur	27,500	None
Port Arthur Canal & Dock Co. (Warren Petroleum Corp.)	Port Arthur	135,000	*†166,500
The Texas Co.	Port Arthur	40,000	None
Sun Oil Co.	Sabine Pass	7,000	6,000
The Texas Co.	Port Neches	1,500	None
Atlantic Pipe Line Co.	Atreco	600	None
Magnolia Petroleum Co.	Smiths Bluff	1,272,700	904,400
Pure Oil Co.	Smiths Bluff		
Sun Oil Co.	Smiths Bluff		
Magnolia Petroleum Co.	Beaumont		
Stanolind Crude Oil Purchasing Co.	Beaumont		
LAKE CHARLES DISTRICT:			
Shell Oil Co., Inc.	Haymark	10,000	†6,000
Magnolia Petroleum Co.	Vincent	70,000	*59,750
Union Sulphur Co.	Vincent	9,500	†5,600
Cities Service Refining Corp.	Rose Bluff	1,000	None
W. T. Burton Co., Inc.	Rose Bluff	7,500	None
Continental Oil Co.	West Lake	3,500	2,000
NEW ORLEANS DISTRICT:		35,000	†21,300
Texas Pacific-Missouri Pacific Terminal Railroad of New Orleans (Sinclair Refining Co.)	Westwego	180,000	99,500
Texas Pacific-Missouri Pacific Terminal Railroad of New Orleans (General American Tank Storage)	Westwego	316,500	194,150
New Orleans Terminal Co. (Chalmette Petroleum Corp.)	Port Chalmette	1,589,200	1,098,550
Standard Oil Co. of Louisiana	Port Chalmette		
Meraux Petroleum Storage Co.	Meraux		

included. ‡Refineries ad-

TEXAS

Able Borden, Wharton	I-5	Bucksnag, C
Ace (Schwab), Polk	L-3	Buffalo, Leon
Adami, Webb	B-7	Burnell, Karn
Adams, Medina	B-5	Burnell, South
Addicks, Harris	J-4	Butler, Freesto
Agua Dulce, Nueces	D & E-7	Buttermilk Slo
Agua Prieta, Duval	C-7	Cabeza, Golia
Alamo, Hidalgo	D-10	Cadena, Duv
Albercas, Webb	B-8	Cadiz, Bee
Albrecht, Goliad	E-6	Caesar, Bee
Aldine, Harris	K-4	Cage, Brooks
Aldine, West, Harris	K-4	Call, Newton
Alfred, Jim Wells	D-7	Calliham, Mc
Alice, Jim Wells	D-7	Calliham, Sou
Alice, East, Jim Wells	D-7	Cam, Duval
Aliet, Harris	J-4	Camp Hill, A
Allen, Brazoria	J-5	Campana, Mc
Alta Loma, Galveston	K-5	Campana, So
Alta Mesa, Brooks	D-9	Camada, Jim
Alta Mesa, East, Brooks	D-9	Cameron, Sta
Alta Mesa, North, Bropks	C-9	Canales, East
Alta Verde, Brooks	C-8	Caplen, Galv
Alta Vista, Bexar	C-5	Capt. Lucy, Ji
Altair, Colorado	H-4	Carolina, Web
Alworth, Jim Hogg	B-9	Carroll, Bastro
Almond, Jim Wells	D-7	Carver-Kallison
Amargosa, Jim Wells	D-7	Casa Blanca,
Amelia, Jefferson	N-4	Cayuga, Ande
Anahuac, Chambers	M-4	Cedar Creek,
Anahuac, South, Chambers	M-4	Cedar Creek,
Anaqua, Victoria	G-6	Cedar Point, C
Anchor, Brazoria	K-5	Cedro Hill, Du
Angelita, San Patricio	E-7	Chapa, Live C
Angleton, Brazoria	K-5	Chapman, Nue
Aransas Pass, Aransas & San Patricio	F-7	Chapman-Abb
Arriola, Hardin	M-3	Chapman Ran
Armour, Matagorda	I-5	Chaparosa, Ji
Armstrong, Jim Hogg	B-8	Charamousca,
Arnum, Fayette	E-4	Charlotte, Ata
Aviator, Webb	B-8	Charco Blanco
Barbacoas, Starr	B-9	Charco Redon
Bailey's Prairie, Brazoria	J-5	Charco Redon
Baldwin, Nueces	E-7	Cheek, Jefferso
Bammel, Harris	K-4	Chenango, Bra
Bandera, Jim Wells	D-8	Chesterville, C
Barbers Hill, Chambers	L-4	Chicon Lake,
Bartlett Wells, Caldwell	E-4	Chiltipin, Duv
Bateman, Bastrop	F-4	China, Jeffers
Batson, Hardin	M-3	China, South,
Bay City, Matagorda	I-5	Chocolate Bay
Bay City, North, Matagorda	I-5	Cistern, Fayet
Beasley, San Patricio	E-7	Citrus Grove,
Beaumont, West, Jefferson	N-4	Clam Lake, Je
Bee Creek, Bastrop	F-4	Clara Driscoll,
Beech Creek, Hardin	M-3	Clark Muil, J
Beech Creek, North, Hardin	M-3	Clark, Guadal
Belknap, Karnes	E-6	Clay Creek,
Ben Bolt, Jim Wells	D-8	Clear Lake,
Benavides, Duval	C-8	Clemens, Braz
Benavides, North, Duval	C-8	Cleveland, Lib
Berclair, Goliad	E-6	Cleveland, N
East Bernard, Wharton	I-5	Clinton, Harri
Bethal, Anderson	I-1	Clodine, Fort
Beulah, Angelina	L-2	Cog City, Kar
Big Creek, Fort Bend	J-5	Cold Springs,
Big Hill, Matagorda	I-6	Cole, Duval
Big Hill, Jefferson	M-4	Cole, East, Du
Bird Island, Kleberg	F-8	Coleto Creek,
Bishop, Nueces	E-8	Collier, Jackso
Blanchard, Duval	C-7	Colmena, Duv
Blanconia, Bee	E & F-6	Cologne, Vict
Blanconia, South, Bee	E & F-6	Coloma Creek
Blas Uribe, Zapata	B-8	Colorado, Jim
Blessing, Matagorda	I-6	Columbia, We
Blessing, East, Matagorda	I-6	Columbus, Co
Bloomington, Victoria	G-6	Camp Eleven,
Blue Lake, Brazoria	J-5	Comitas, Zapa
Blue Ridge, Fort Bend	J-4	Concord, And
Bob Rose, Caldwell	E-4	Conoco Drisc
Boedecker, Brooks	D-9	Conroe, Monte
Boggy Creek, Cherokee & Anderson	K-1	Cooksey, Bexa
Boling, Wharton	I-5	Coquat, Live
Bonnie View, Refugio	F-7	Cordelle, Jack
Borregas, Kleberg	E-8	Cordelle, Nort
Bosque, McLennan	F-1	Corpus Christ
Boyce, Goliad	E-6	Cortez, Starr
Boyle, Starr	C-9	Cosden, Bee
Brayton, Nueces	E-7	Cotton Lake,
Brenham, Washington & Austin	H-4	Cotton Lake,
Bridwell, Duval	C-7	Cottonwood, L
Brookshire, Austin & Waller	I-4	Cottonwood C
Brownlee, Jim Wells	D-7	County Line,
Bruni, Webb	B-8	Crowther, Mc
Brushy Creek, Lavaca & De Witt	G-5	Cuellar, Zapa
Brushy Creek, Anderson	J-1	Dabovan, Wh
Bryan Mound, Brazoria	K-5	Dale, Bastrop
Buchanan, Caldwell	E-4	Dale, South,
Buckeye, Matagorda	I-6	Dale, West,
Buckeye, South, Matagorda	I-6	Damon Moun
		Dan Sullivan,
		Danbury, Bra

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GULF OF M

OIL AND GAS FIEL

Name, County or Parish, and Location on Map

Colorado	H-5	Darst Creek, Guadalupe	E-4	Gregory, San Patricio	F-7	La Salle, Jackson	H-6
on	I-1	Davis Hill, Liberty	L-3	Greta, Refugio	F-6	La Ward, North, Jackson	H-5
rnes & Bee	E-6	Davisville, Angelina	L-1	Grimes, Houston	K-1	Labbe, Duval	C-7
uth, Karnes	E-6	Day, Caldwell	E-4	Groesbeck, Limestone	H-1	Lacy, Hidalgo	D-10
stone	J-1	Dayton, North, Liberty	L-4	Guerra, Starr	B-9	Lake Creek, Montgomery	J-3
Slough, Matagorda	I-6	Delhi, North, Harris	J-4	Gulf O'Connor, Refugio	F-6	Lakeview, Wharton	I-5
oliad	E-6	Deupree, Bexar	C-5	Gyp Hill, Brooks,	D-8	Lamar, Aransas	G-7
uval	C-7	Devine, Medina	B-5	Halls Bayou, Brazoria	K-5	Landa, Hidalgo	D-10
	D-6	Dial, Goliad	E-6	Hamburger, Wharton	I-5	Lane City, Wharton	I-5
e	D-6	Dickinson, Galveston	L-5	Hamel, Colorado	H-4	Las Animas, Jim Hogg	B-8
ks	D-8	Dinero, Live Oak	D-7	Hamman, Matagorda	I-5	Las Mujeres, Webb	B-8
on	N-3	Dinn, Duval	C-8	Hampton, Hardin	M-3	Laurel, Webb	B-8
McMullen	C-6	Dirks, Bee	D & E-6	Hankamer, Liberty	M-4	Lavaca Point, Calhoun	H-6
South, McMullen	C-6	Dohle, Willacy	E-9	Hantho-Nelson, Bastrop	F-4	Lavernia, Guadalupe	D-5
al	B-8	Double Gum, Liberty	M-4	Hardin, Liberty	L-3	League City, Galveston	K-5
Anderson	J-1	Dougherty, Nueces	E-7	Harmon, Wharton	H-5	Leaseholders, Webb	B-7
McMullen	C-7	Dunlap, Caldwell	E-4	Hartman, Zapata	B-9	Lentz, Bastrop	F-4
South, McMullen	C-7	Dunley, Medina	B-5	Hastings, Brazoria	K-5	Liberty Acres, Liberty	K-3
Jim Wells	D-7	Dyersdale, Harris	K-4	Hawkinsville, Matagorda	J-6	Liberty, South, Liberty	L-4
Starr	C-9	Eagle Hill, Duval	C-7	Hayden, Starr	B-9	Lissie, Wharton	H-4
East, Kleberg	D-8	Eastfield, Jim Hogg	B-9	Hebbronville, Jim Hogg	B-8	Little Kentucky, Jackson	H-5
alveston	M-5	Echols, Zapata	A-9	Henne-Winch-Farris, Jim Hogg	B-8	Livingston, Polk	L-3
, Jim Wells	D-7	Eckert, Bexar	C-5	Henshaw, Jim Wells	D-7	Lobo, Live Oak	D-6
Webb	B-8	Edmonds, Brazoria	K-5	Herbst, Duval	C-7	Lochridge, Brazoria	J-5
strop	F-4	Edna, Jackson	G-5	Heyser, Calhoun & Victoria	G-6	Lolita, Jackson	H-6
llison, Guadalupe	E-4	Edwards, Victoria	G-6	High Island, Chambers	M-4	Loma Alta, McMullen	C-7
nca, Duval	B-7	Egypt, Wharton	I-5	Hilbig, Bastrop	F-4	Loma Blanca, Brooks	D-8
Anderson & Freestone	I-1	El Campo, Wharton	I-5	Hillje, Wharton	H-5	Loma Novia, Duval	C-7
ek, Bastrop	E-4	El Campo, North, Wharton	I-5	Hillje, South, Wharton	H-5	Loma Valdez, Webb	B-8
ek, Limestone	H-1	El Campo, South, Wharton	I-5	Hilltop, Bexar	C-5	Loma Vista, Duval	C-7
nt, Chambers	L-4	El Mesquite, Duval	B-8	Hinnant, Live Oak	D-7	London, Nueces	E-8
, Duval	B-7	El Toro, Jackson	H-5	Hirsch, Webb	A-7	Lone Oak, Bexar	D-5
ve Oak	D-7	Elgin, Bastrop	F-3	Hitchcock, Galveston	L-5	Lonestar, Cherokee	L-1
Nueces	E-8	Ellison-Young, Caldwell	E-4	Hobson, Karnes	D-5	Long Lake, Anderson, Freestone & Leon	J-1
-Abbott, Williamson	F-3	Elkhart, Anderson	J-1	Hockley, Harris	J-4	Long Lake, East, Anderson	J-1
Ranch, Nueces	E-8	Elm Bayou, Chambers	M-4	Hoffman, Duval	C-7	Long Point, Fort Bend	J-5
a, Jim Hogg	B-9	Elm Creek, Guadalupe	D-5	Hoffman, South, Duval	C-7	Longhorn, Duval	C-8
usca, Duval	B-7	Escobas, Zapata	A-8	Holbein, Webb	B-8	Lopena, Zapata	A-9
Atascosa	B-6	Espada Mission, Bexar	C-5	Holcomb, Milam	F-2	Lopez, Webb	B-7
anco, Starr	C-10	Esperson, Liberty	L-4	Holland, Jim Hogg	B-8	Los Indios, Hidalgo	D-9
edondo, Zapata	B-9	Esperson Dome, South, Liberty	L-4	Holtzmark, Bee	D-6	Los Picachos, Duval	C-7
edondo, East, Zapata	B-9	Eureka, Harris	K-4	Hondo Creek, Karnes	E-6	Los Olmos, Starr	B-9
fferson	N-4	Ezzell, McMullen & Live Oak	C-9	Hope, Lavaca	G-5	Lost Lake, Chambers	L-4
o, Brazoria	K-5	Fagan, Refugio	G-6	Hordes Creek, Goliad	E-6	Lott, Falls	G-2
lle, Colorado	I-4	Fairbanks, Harris	J-4	Hoskins Mound, Brazoria	K-5	Louise, Wharton	H-5
ake, Medina	B-5	Fairfield, Bexar	B-5	Houston, North, Harris	K-4	Louise, North, Wharton	H-5
Duval	D-7	Falfurias, East, Jim Wells	D-8	Houston, South, Harris	K-4	Louise, West, Wharton	H-5
efferson	N-4	Falls City, Karnes	D & E-5	Howell, Jim Wells	D-7	Lovells Lake, Jefferson	N-4
outh, Jefferson	M-4	Fannett, Jefferson	N-4	Huff, Refugio	F & G-6	Lovells Lake, North, Jefferson	N-4
e Bayou, Brazoria	K-5	Fannett, East, Jefferson	N-4	Hull, Liberty	L-3	Luby, Nueces	E-8
Fayette	E-4	Fannin, Goliad	F-6	Humble, Harris	K-4	Lucas, Live Oak	D-7
rove, Matagorda	I-6	Fannin, North, Goliad	F-6	Hungerford, Wharton	H-4	Lucky, Matagorda	I-5
ke, Jefferson	N-4	Ferguson Crossing, Grimes	J-3	Huntington, Angelina	M-2	Luling, Caldwell & Guadalupe	E-4
iscoll, Nueces	E-7 & 8	Fig Ridge, Chambers	M-4	Hutchins, Wharton	H-5	Luling-Branyon, Caldwell	E-4
uil, Jim Wells	D-7	Fishers Reel, Chambers	L-4	Huxley, Shelby	N-1	Lundell, Duval	B-7
uadalupe	E-5	Fitzsimmons, Duval	D-7	Hyatt, Tyler	M-3	Lytton Springs, Caldwell	E-4
eek, Washington	H-3	Flores, Starr	C-9	Hynes, Refugio	F-6	Macdonna, Bexar	B-5
ake, Harris	K-4	Floresville, Wilson	D-5	Hysaw, Karnes	D-5	Maedgon, San Patricio	E-7
, Brazoria	J-5	Flour Bluff, Nueces	F-8	Imogene, Atascosa	C-5	Maetze, Goliad	F-6
nd, Liberty	L-3	Flour Bluff, East, Nueces	F-8	Ina, Medina	B-5	Madisonville, Madison	I-2
nd, North, Liberty	L-3	Foley, Bee	D-6	Inglehart, Colorado	H-5	Magnet-Withers, Wharton	I-5
Harris	K-4	Fordtran, Victoria	G-5	Jackson Pasture, Chambers	L-4	Magnolia, Montgomery	J-3
Fort Bend	J-4	Fostoria, Montgomery	K-3	Jacobs, McMullen & Live Oak	C-6	Magnolia City, Jim Wells	D-8
y, Karnes	D-6	Fox, Refugio	F-6	Jacobs, North, McMullen & Live Oak	C-6	Magnolia City, North, Jim Wells	D-8
prings, San Jacinto	K-3	Francitas, Jackson	H-6	Jakalak, Starr	B-9	Manda, Travis	E-3
uval	B-8	Fred, Tyler	N-3	Jay Welder, Calhoun	H-6	Manford, Guadalupe	E-4
ast, Duval	B-8	Freisburg, Colorado	H-4	Jennings, Zapata	B-8	Manila, Jim Hogg	B-8
Creek, Victoria	F-6	Friendswood, Harris	K-4	Joes Lake, Tyler	N-3	Manvel, Brazoria	K-5
Jackson	G-5	Friotown, Frio	A-5	Jones, Bexar	D-5	Marback, Live Oak	D-6
a, Duval	B-7	Frost, Starr	C-9	Jones, Jim Hogg	C-9	Marcado Creek, Victoria	G-6
o, Victoria	F-6	Ft. Merrill, Live Oak	D-7	Josey Ranch, Harris	J-4	Margo, Starr	B-9
Creek, Calhoun	H-6	Gaffney, Victoria	F-6	Jourdanton, Atascosa	C-6	Mariposa, Brooks	D-8
io, Jim Hogg	B-9	Gallagher, Jim Wells	E-7	Joyce Richardson, Harris	J-4	Markham, Matagorda	I-5
ia, West, Brazoria	J-5	Gallatin, West, Cherokee	K-1	Katy, Harris, Waller & Fort Bend	J-4	Markham, North, Matagorda	I-5
ous, Colorado	H-4	Ganada, Jackson	H-5	Katy, North, Harris & Waller	J-4	Marquez, Leon	I-2
Eleven, Tyler	N-3	Ganada, West, Jackson	H-5	Kay Creek, Victoria	F-6	Martha, Liberty	L-4
s, Zapata	B-9	Garcia, Starr	C-10	Keechi, Anderson	J-1	Martinez, Zapata	A-8
d, Anderson	J-1	Garwood, Colorado	H-5	Keeran, Victoria	G-6	Masey, West, San Jacinto	K-3
o Driscoll, Duval	C-8	Garwood, West, Colorado	H-5	Kelsey, Brooks & Starr	C-9	Mathis, San Patricio	D & E-7
, Montgomery	K-3	Gas Ridge, Bexar	C-5	Kelsey, Deep, Brooks	C-9	Mathis, East, San Patricio	E-7
y, Bexar	D-5	Genevieve, Bee	E-6	Kennard, Starr	C-9	Matthews, Williamson	F-3
t, Live Oak	D-6	Genoa, Harris	K-4	Killam, North, Webb	B-8	Matzke, Wharton	I-5
le, Jackson	H-5	Gilbert Ranch, Jefferson	M-4	Kimbro, Travis	E-3	Maubro, Jackson	H-5
le, North, Jackson	H-5	Gillock, Galveston	L-5	Kingsville, Kleberg	E-8	Mauritz, Jackson	H-5
Christi, Nueces	F-7	Ginter, Angelina	L-2	Kirby, Liberty	L-4	Mauritz, East, Wharton	H-5
Starr	C-10	Glasscock, Colorado	H-4	Kittie, Live Oak	D-6	Mayes, Chambers	L-4
n, Bee	E-6	Glen, Webb	B-8	Kohler, Duval	B-8	Mayes, East, Chambers	L-4
Lake, Chambers	L-4	Glendale, Trinity	K-2	Koontz, Victoria	G-6	Mayes, South, Chambers	L-4
Lake, South, Chambers	L-4	Goebel, Live Oak	D-6	Koopman, Jim Wells	D-7	Mayo, Wharton	H-5
wood, Liberty	M-4	Goliad, North, Goliad	F-6	Kosse, Limestone	H-2	McAllen, Hidalgo	D-10
wood Creek, De Witt	F-5	Goliad, West, Goliad	F-6	Kreis, Duval	C-7	McCaskill, Karnes	E-6
y Line, McMullen	C-7	Goodrich, Polk	L-3	Kreis, North, Duval	C-7	McCoy, Liberty	L-3
her, McMullen	C-6	Goose Creek, Harris	L-4	Kubela, Wharton	I-5	McCrary, Fort Bend	J-4
r, Zapata	B-8	Gormac, Duval	C-7	La Belle, Jefferson	N-4	McDermott, Zapata	A-9
an, Wharton	I-5	Government Wells, Duval	C-7	La Blanca, Hidalgo	D-10	McFaddin, Victoria	G-6
Bastrop & Caldwell	F-4	Grande, Starr	B-10	La Fevre, Jm Hogg	B-8	McFaddin, North, Victoria	G-6
South, Caldwell	E-4	Grapeland, Houston	J-1	La Gloria, Jim Wells & Brooks	D-8	McGill, Kenedy	D-8
West, Caldwell	E-4	Grayburg, Bee	D-6	La Reforma, Starr	C-9	McLeon, Webb	B-8
n Mound, Brazoria	J-5	Green, Karnes	E-6	La Reforma, South, Starr	C-9	McMurray, Bee	E-6
Sullivan, Brooks	D-8	Green Branch, McMullen	B-6	La Rosa, Refugio	F-7	McNeill, Live Oak	D-7
ury, Brazoria	K-5	Greens Lake, Galveston	L-5	La Sal Vieja, Willacy	D & E-10	Medina, South, Bexar	C-5
						Medio Creek, Bee	E-6
						Mellon Creek, Refugio	F-6
						Menefee, Wharton	H-5
						Mercedes, Hidalgo	D-10
						Mercy, San Jacinto	K-3
						Mexia, Limestone	H-1
						Meyersville, De Witt	F-6
						Mid Ojvelas, Webb	B-8
						Midfields, Matagorda	I-6
						Midway, San Patricio	F-7
						Millican, Brazos	I-3
						Mineral, Bee	D-6
						Minnie Bock, Nueces	E-7
						Minnie Bock, North, Nueces	E-7
						Minerva-Rockdale, Milam	G-3
						Mirando City, Webb	B-8
						Mirando Valley, Zapata	B-8
						Mission River, Refugio	F-7
						Mission Valley, Victoria	F-5
						Moca, Webb	B-7
						Mont, Lavaca	G-5
						Monte Negra, Kleberg	D-8
						Moody Ranch, Jackson	H-6
						Morales, Jackson	G-5
						Moss Bluff, Liberty	L-4
						Mountain View, Live Oak	C-7
						Mt. Houston, Harris	K-4
						Munson, McMullen	B-7
						Mustard Creek, Jackson	H-5
						Mykawa, Harris	K-4
						Nacogdoches Shallow, Nacogdoches	M-1
						Nada, Colorado	H-5
						Nada, North, Colorado	H-5
						Nash, Brazoria	J-5
						Nash Creek, Guadalupe	E-4
						Navarro Crossing, Houston	J-1
						Navidad, Jackson	G-5
						Neches, Orange	N-4
						Needville, Fort Bend	J-5
						Nein, Nueces	E-8
						New Batson, Hardin	M-3
						New Rockland, Tyler	M-2
						New Ulm, Austin	H-4
						Neuhaus, Jim Hogg	B-9
						Nichols, Hidalgo	C-10
						Nigger Creek, Limestone	H-1
						Noack, Williamson	F-3
						Nolte, Guadalupe	D-5
						Nome, Jefferson	M-4
						Nordheim, De Witt	E-6
						Normangee Flynn, Leon	I-2
						Normanna, Bee	E-6
						Nursury, Victoria	G-5 and G-6
						Oakville, Live Oak	D-6
						Oakwood, Freestone	I-1
						Oakwood, Leon	J-2
						O'Connor, Refugio	G-6
						Odem, San Patricio	E-7
						O'Hern, Duval	B-8
						O'Hine, Gonzales	E-4
						Oilton, Webb	B-8
						Old Ocean, Brazoria	J-5
						Olive, Hardin	M-3
						O'Neil, San Patricio	E-7
						Orange, Orange	N-4
						Orange, Southwest, Orange	N-4
						Orange Grove, Jim Wells	D-7
						Orange Hill, West, Colorado	H-4
						Orchard, Fort Bend	I-4
						Ormsby, Wilson	D-5
						Oyster Bayou, Chambers	M-4
						Palacious, Matagorda	I-6
						Palagana, Duval	C-7
						Palestine, Anderson	J-1
						Palo Blanco, Brooks	C-8
						Patel, Jim Hogg	B-8
						Pearsall, Frio	A-6
						Pearsall Townsite, Frio	A-6
						Pena, Duval	C-7
						Penitas, Hidalgo	C-10
						Percilla, Houston	K-1
						Peters, Duval	B-7
						Peters, East, Duval	B-7
						Petronilla (N	J-4
						Pettus, Bee	A-9
						Pettus, New	G-6
						Peyote, Jim	G-6
						Pickering, S	D-8
						Pickett, Live	B-8
						Pickett Ridge	E-6
						Piedra Lumb	D-7
						Piedras Pint	C-5
						Pierce Junct	E-6
						Pine Isle, Je	F-6
						Pinehurst, M	H-5
						Pita, Brooks	D-10
						Placedo, Vic	K-3
						Placedo, Eas	H-1
						Pledger, Bra	F-6
						Plummer, Be	B-8
						Plymouth, Sc	I-6
						Poehler, Gol	F-7
						Pohl, Lavaca	I-3
						Point Bland,	D-6
						Point Isabel,	E-7
						Port Acres, J	E-7
						Port Neches,	G-3
						Port Neches,	B-8
						Porter, Karne	B-8
						Post Oak, F	F-7
						Poth, Wilson	F-5
						Powderhorn,	B-7
						Premont, Jim	G-5
						Pridham Lak	D-8
						Provident Cit	H-6
						Raccoon Ben	G-5
						Rachal, Broo	L-4
						Ramer Islan	C-7
						Ramsey, Colo	K-4
						Rancho Solo,	B-7
						Randado, Jim	H-5
						Ray, Bee	K-4
						Red Lake, Fr	M-1
						Red Rock, Ba	H-5
						Redfish Reef,	H-5
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						Reiser, Webb	E-4
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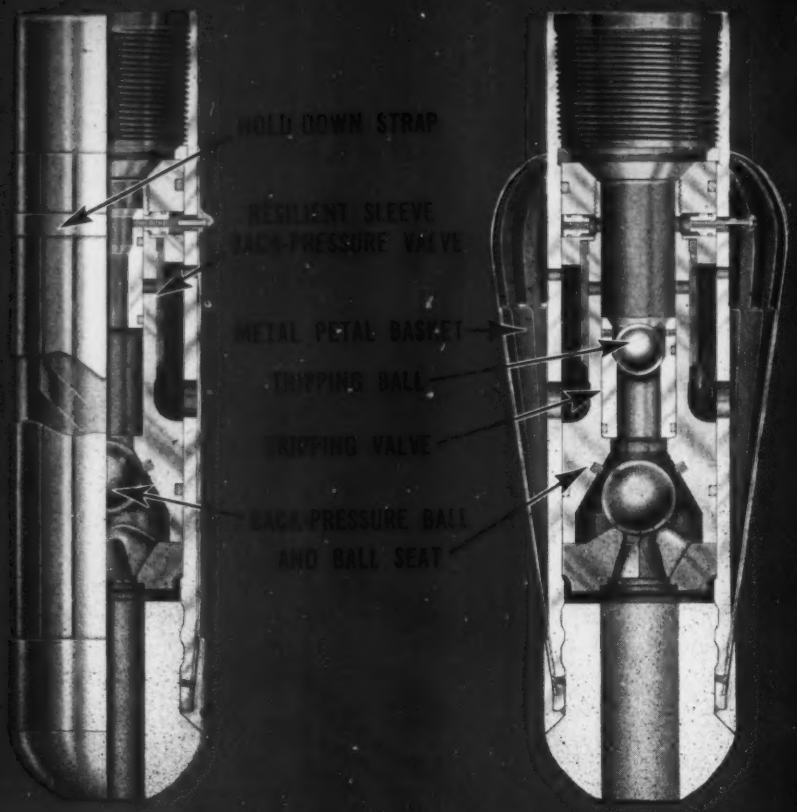

THE BAKER *Triplex* CEMENTING SHOE does an important job...and does it well!

The "Triple" purpose of the Baker TRIPLEX Cementing Shoe is to pack-off in large-diameter, or irregularly-shaped holes, retain all cement slurry above the shoe, and protect permeable, low-pressure formations below from cement contamination.

All cement slurry is directed upward through side whirler ports. A sleeve-type, resilient rubber back-pressure valve opens readily to permit passage of the slurry into the annulus around the shoe, but closes instantly to prevent any return flow of slurry. The Baker Metal Petal Basket is intended to form a bridge, thus preventing cement slurry from settling into permeable, low-pressure zones below. The Basket is indispensable in large-diameter, or irregular-shaped holes.

The Baker TRIPLEX Cementing Shoe (Product No. 136) operates as a conventional float shoe while running-in the casing. Then, after reaching the desired point in the hole, circulation is established through the ample interior passageway of the shoe, and the hole is conditioned preparatory to cementing. The Tripping Ball now is pumped (or allowed to gravitate) down the hole to seat upon the Tripping Valve. A pressure of 400 to 500 psi is applied to the casing which shears the screws in the Tripping Valve, permitting it to move downward and expose the cementing ports. Shearing these screws also releases the hold-down strap around the basket, allowing the basket to expand outwardly against the wall of the hole. The cementing operation is then carried out in the conventional manner with all cement slurry directed upward and held above the shoe by the expanded Baker Metal Petal Basket.

The Baker TRIPLEX Cementing Shoe consists of a whirler float shoe with a Baker Metal Petal Basket fastened on the shoe below the cementing ports. All internal parts are made of readily drillable materials. Two one-half inch set screws hold the inner assembly stationary to facilitate drilling out the shoe.

Contact your nearest Baker office or representative for details and recommendations.

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THE OIL AND GAS JOURNAL

An Active Area

IN this issue the Journal resumes its annual prewar publication of a special section devoted to the Gulf Coast. As Journal editors, in addition to those staff members permanently located there, started work on several features of this section they quickly appreciated the truth of the observation of an operator in the area: "If it is part of the oil business we have it."

Gulf Coast operators in their search for new fields have used all the exploratory tools and methods and are responsible for many new applications. Because they found oil under most difficult terrain conditions this country has important proven reserves in areas that were considered inaccessible for oil development a few years ago.

Operators moved into the adjoining waters and drilled with barge equipment which focused attention on their activities within and outside the petroleum industry throughout the entire country. Now they are moving into still deeper waters with installations never previously attempted anywhere. Millions are to be hazarded to determine whether or not the offshore area of the Gulf Coast is, as many believe, one of the major oil reserves. The 6 billion barrels of accumulated crude-oil output have come from wells varying from a few hundred feet to the record producing depth of 13,888 ft.

Interesting phases of Gulf Coast drilling and development also are found in the land areas. An important part of approximately 1½ million barrels daily of liquid petroleum comes from depths below 10,000 feet. Deep drilling has had its widest application in coastal fields and new problems are constantly presenting themselves for solution. The area is the water and pipeline-transportation center of the world petroleum industry.

Most of the 100 per cent expansion in the production of natural gasoline and associated products of the past 6 years is accounted for by the new gasoline plants and cycling operations of the coastal fields. The practical arts of cycling to increase the recovery of light liquid hydrocarbons can largely be credited to coastal operators.

The war and what has happened since have strengthened the Gulf Coast's position as the largest refining center. Most of the war expansion which necessitated expenditures aggregating approximately a billion dollars, including petrochemical operations, has been converted to peacetime processing. The manufacture of synthetic-rubber components is now well established as a permanent part of petroleum manufacturing. As revealed in this issue, petroleum is the base for a wide range of chemical operations.

So we are glad of this opportunity of a special salute to the thousands engaged in all divisions of Gulf Coast oil operations. This account is not a history but rather a report of today's activities, with projections which point to a future of even greater potentialities than past accomplishments.

Texas Eastern Offering 8 Cents For Long-Term Gas Contracts

TEXAS EASTERN TRANSMISSION CORP. is now contracting with producers in the Southwest for Big Inch natural gas at prices ranging up to 8 cents per 1,000 cu. ft. on long-term contracts.

Texas Eastern was high bidder for the government-owned 24-in. and 20-in. pipe-line system in the sale earlier this year, and the company is now operating the lines on a temporary basis with its application for a permanent certificate pending before the Federal Power Commission.

The prices it is offering for its permanent gas supply represent a marked advance over previously accepted rates and emphasize predictions made in discussions of the natural-gas industry that increased utilization of gas will result in higher prices to the producer.

The company is reported to be well along on contracts for gas for the first phase of its permanent operations which will require about 500,000,000 cu. ft. daily. In a company statement of policy on gas purchases, Texas Eastern establishes a price of 6½ cents per 1,000 cu. ft. for a 5-year contract with 1 mill added for each year's duration of the contract up to 20 years, thus giving an 8-cent maximum.

Delivery in T.E.T. Lines

The policy memorandum says all deliveries will be made at the seller's expense into Texas Eastern's lines at points mutually agreed on and against a pressure not to exceed 800 psig. The company requires that the gas be scrubbed and dehydrated so as to contain not more than 7 lb. of water or more than 200 gal. of liquid hydrocarbons per 1,000,000 cu. ft.

"These prices are based on the gas being measured at 2 lb. above atmospheric pressure and on the gas having a gross B.t.u. heating value of 1,000 B.t.u. saturated," the memorandum says. "A provision will be incorporated to protect the seller against any increase in taxes, other than ad valorem and income taxes, to the extent to seven-eighths of such increase.

"Each seller will be required to demonstrate that it has reserves available for delivery under the contract equal to 150 per cent of the product of the estimated annual deliveries time the number of years incorporated in the contract. Each seller shall also required to have available for delivery at all times 150 per cent of the estimated average daily amount the seller may be required to deliver."

A Nondiscriminatory Basis

The policy memorandum points out that Texas Eastern in its proposal to purchase the lines is committed to buy up to 25 per cent of flared gas if available and that "this part of the purchases will have to be reserved until it can be determined whether such amount of flared gas is available for purchase." The remaining 75 per cent, it says, will be purchased on "a nondiscriminatory basis from producers, independents and majors alike, who desire to contract and can meet the requirements of T.E.T. Corp."

Capacity Expansion Planned

The company ultimately plans to expand capacity to 800,000,000 cu. ft. daily after full conversion through installation of compressor and other equipment. Gas is now being contracted for in the Gulf, East Texas and Louisiana areas, but long-range expansion plans hold the possibility that North and West Texas producing areas may eventually be reached.

After sufficient gas is contracted, the company is planning to take gas roughly on the same basis as reserves, for example, an operator with 10 per cent of the total reserves contracted to sell 10 per cent of the line capacity.

To determine the extent of flare gas available, Texas Eastern is preparing to have surveys made, by independent engineering firms: in Texas, Barbeck, Edgerton, Payne & Stearns, Austin, and in Louisiana, by Dr. J. Huner & Associates. Data obtained in the survey will be presented to the FPC.

Already offered to the company is a reported 100,000,000 cu. ft. daily of casing-head gas equivalent, the residue from gasoline plants. Texas Eastern is attempting to assist plants to tie into the system and to find the necessary equipment, including pipe, dehydration facilities, and compressors, which are in short supply. The 100,000,000 cu. ft. daily commitment is the result of personal visits made by company officials to all gasoline-plant operators in the immediate area to serve the system.

The company is now described as in the stage of "selective buying," of gas-field gas. This will be gathered by United Gas Co., Lone Star Gas Co., Arkansas-Louisiana Gas Co. and R. Lacy. For the Big Inch, gas-field gas will come from Carthage, Jefferson, and Harleton in Texas; Rodessa in Texas and Louisiana and numerous other fields served by Lone Star. Little Inch gas from gas fields will come from Lisbon and Lucky fields in Louisiana, and Fannett, Lovells Lake, and Cheek, Texas, as well as many other fields served by United.

T.E.T. Own Sales Contract

In March, Texas Eastern entered into a contract to sell gas on the outlet end of the lines to East Ohio Gas Co., Peoples Natural Gas Co., and New York State Natural Gas Corp., subsidiaries of Consolidated Natural Gas Co. The contract is contingent on final acquisition of the lines by Texas Eastern.

Amount to be delivered under the contract is 125,000,000 cu. ft. daily, increased to 200,000,000 cu. ft. when the line's capacity is raised to 425,000,000 cu. ft. daily. Price for the gas is 25.9 per 1,000 cu. ft. prior to the time Texas Eastern increases deliveries to 125,000,000 cu. ft. daily.

Afterwards, the price is divided to include a demand charge and a commodity charge. The monthly demand charge is $1.50 per 1,000 cu. ft. for certain specified maximum deliveries. The commodity charge is 25 cents per 1,000 cu. ft.

The agreement also provides that at the end of the first 10 years the price shall be increased by one-half of the amount by which the average cost of gas to Texas Eastern exceeds 8 cents, up to 12 cents.

Boyd Asks Restoration of OGD Appropriations

William R. Boyd, president of the American Petroleum Institute, has asked Congress to restore funds for the Oil and Gas Division on grounds it is a praiseworthy effort toward government - industry cooperation in peacetime.

In a statement filed with a Senate appropriations subcommittee, Boyd pointed out his statements were made as an individual and that the Institute itself has taken no stand on funds for the agency.

The A.P.I. head emphasized that neither the oil nor the natural-gas industry had sought OGD and declared its services would be almost entirely for the benefit of the Government and the public.

Declaring that there is a "clear and useful field" for OGD if it did nothing more than assemble the various state and federal statistics, Boyd said: "I think that Secretary Krug sincerely and earnestly is seeking to try out an experiment in peacetime cooperation with an industry which means so much to the national security, economic and industrial needs and social welfare of the nation."

Industry's Prewar Spending Must Be Trebled, Wilson Says

EXPENDITURES three times those of the 1936-1946 period must be made by the petroleum industry for several years to come, Dr. Robert E. Wilson, chairman of the board of Standard Oil Co. (Ind.), told stockholders at the company's annual meeting May 22.

Wilson said annual expenditures of about $3 billion will be needed to: find and develop additional sources of oil; build new pipe lines and refinery units to keep ahead of a rapidly increasing demand; institute new conservation methods; make gasoline from natural gas and develop new products; provide for general improvement of facilities; and develop foreign sources of oil for the United States.

The stockholders also heard A. W. Peake, president, predict shortages of petroleum products, particularly heating oils, until the petroleum industry is able to expand its facilities to take care of the increased demand.

Wilson called for both lower taxes and higher earnings to secure the great amount of money needed by the oil industry and told stockholders industry must be willing to reinvest more than half its earnings "as well as using other avilable sources of capital" to keep ahead of the demand for its products.

Public Understanding of Reports

"The public," he said, "should understand that our reported profits are based on the average book costs of our reserves, more than half of which were discovered a decade or more ago. Our problem is to have enough profit to cover our much higher replacement costs and to provide or attract the capital needed to maintain the rate of growth and continued quality improvement that our customers expect of us."

For the public's own good, he asserted, there must be reasonably high earnings and prices during the period when demand is straining supply possibilities. Prices, he said, while higher than when under Office of Price Administration control, are 81.7 per cent of 1926 levels as compared with 182.6 for farm products and 143.5 for manufactured articles generally. Their increase since 1940 is less than half that of all prices, he added.

The large expenditures in prospect, Wilson said, are due in part to the higher costs of everything the industry needs. The cost of wildcat wells per barrel of oil discovered is six times higher, while in refining, the higher construction costs, higher safety standards, and added technological developments make it necessary to spend three times the amount required 10 years ago.

Peake told stockholders the 1,542,000 space heaters and central heating oil burners installed in American homes in 1946 and the 2,650,000 more on order will increase the demand for burning oils by 120,000,000 bbl. a year, or about 50 per cent above the quantity sold by the industry in 1941.

"Trying to solve this problem, the industry is in a tight race to expand its facilities as demand increases," he declared. "Both the industry and our company need more pipe lines, more refinery units, more tank cars, and more of other equipment for making products and getting them to the user. . . . I am satisfied that when we can obtain more materials we can and soon will provide the facilities to keep up with the growing demand. . . . Until that time, and it will not be this year, there probably will be some periods when the supply of finished products will be short."

Suspensoid Process Useful to Refiners, W. P. R. A. Group Told

FORT WORTH. — The Suspensoid catalytic-cracking process, developed and operated by Imperial Oil, Ltd., engineers, offers one proven method by which refiners may improve the octane rating and engine performance of motor fuels, technologists were told here May 23 by Dr. Robert L. Purvin, Dallas consulting engineer. Purvin discussed the more recent developments in the technique of the process and results obtained.

The time factor in the elements of time, temperature, and pressure seems to be much less critical in Suspensoid operations than in thermal cracking, Purvin said. The process is carried out by making a slurry of charge stock and finely divided fuller's earth or other clay catalyst and mixing with the main body of the charge which is passed through the heating coil and into a flash chamber where the vapors are freed from the liquid and catalyst. Relatively high pressures are employed, for example, 400 psig., and temperatures of 950° F. or higher, depending on the product desired.

Cracking takes place in the vapor phase, he stated. An increase in octane of 6 to 8 numbers higher than can be obtained by thermal cracking results, he said. Catalyst effectiveness is decreased by raising the temperature above the optimum for any given operation. It is highly important that the charge be maintained in the vapor phase and the addition of light products, such as butane, insures vaporization of the charge practically completely.

Some molecular rearrangement of the butane occurs, two to three times as much isobutane being found in the product as was present in the charge blend. Addition of naphthas shows little difference in the octane rating of the final product, which indicates that reforming of the naphtha keeps pace approximately with the cracking of the heavier gas oil. Reduced crude has not been used as charge stock commercially, the speaker said. However, little if any catalytic effect was found when treating 100 per cent naphtha the results corresponding approximately with thermal reforming.

Cycling Operations Expanding

Cycling plants operating chiefly in Texas and Louisiana are increasing their outputs greatly and may become an important factor in the motor-fuel and other oil-products markets, Arch L. Foster, refining editor of The Oil and Gas Journal, told the group. In Texas alone 11,000,000 bbl. of condensate was produced in 1946, along with 40,000,000 bbl. of natural gasoline and considerable amounts of kerosene and other products. Indications of an as-yet-incomplete survey of the output of different products are that up to 5,000,000 bbl. per month of total liquid products are made, with a number of fields being studied for these operations. Of this total liquid yield, some 40 per cent or more is made directly into motor fuel, and showing 63-67 octane number generally, before addition of lead, he said.

These raw products such as gasoline may be reformed thermally with about the same results as obtained from reforming refinery naphthas. Catalytic reforming and desulfurization will improve these products to compete with similar products from refinery operations, it was stated, and several operators of cycling and similar plants are considering ways and means of improving their motor fuels.

Tank-car shipments are expected to break all existing records this summer from Permian basin fields. The largest rail shipping point is this 74-spot loading rack, operated by Atlantic Pipe Line Co. at Midland. A pool of 1,500 cars is expected to be available to move upwards of 60,000 bbl. of oil daily to East Texas and the Gulf Coast

West Texas Tank-Car Shipments To Reach Peak This Summer

by Carl F. Hoot

PERMIAN basin producers for several months have been enjoying an unprecedented demand for oil. This high demand, which has purchasers competing for new connections, greatly exceeds present pipe-line capacity leading from the area, and shipments are being augmented by tank-car movements. By midsummer, these shipments are expected to break all such records for total movement out of the basin.

Bulk of tank-car shipments is handled at Atlantic Pipe Line Co.'s 74-spot Midland terminal, which has an estimated loading capacity of 5,400 bbl. of oil an hour, sufficient to take care of all cars that are expected to be available this summer. This large loading rack was put into service in late April and handled 31,000 bbl. of oil in the last 5 days of that month. By the first half of May, 1,060 cars had been loaded with approximately 244,000 bbl. of crude.

A pool of 1,500 tank cars is expected to be available within a few weeks for movement of West Texas crude from Midland to Camp Switch, in East Texas field, from which point the crude will be charged to pipe lines leading to the Gulf Coast. The bulk of this crude is handled under contracts with Atlantic Refining Co. and Humble Oil & Refining Co. Shipments along the 450-mile route require a 5-day turn-around for tank cars, which will give the operators about 300 cars a day.

Due to limited unloading capacity at the East Texas end, however, tank-car shipments, if they reach the proposed volume, may extend to the Gulf Coast from West Texas. Rail rates, from Midland to Camp Switch, in full train-load shipments (70 to 80 cars), is 13 cents cwt., which will average about 43 cents per barrel, or nearly twice the pipe line rate to the Gulf Coast.

Several smaller loading racks are in use in the Permian basin. Wickett Refining Co.'s 12-car rack at Wickett, Tex., is loading crude for shipment to Standard Oil Co. of Texas and McNutt Oil & Refining Co. in the El Paso area. These shipments augment runs of the Pasotex Pipe Line from West Texas to El Paso, Tex.

At Jal, N. M., Texas-New Mexico Pipe Line Co.'s 19-spot loading rack is handling about 1,800 bbl. per day of sweet and sour crude, consigned to the British-American Oil Co., Ltd., at Moose Jaw, Saskatchewan. The rate on this oil runs 71 cents cwt., or $2.35 per barrel. Serving the Garza field, a 12-car rack near Post, Tex., is loading some 3,400 bbl. of oil a day for shipment to National Cooperative Refinery Association's plant at McPherson, Kans. Other small racks are furnishing rail outlets for unconnected pools in Kent and Coke counties.

618,000-Bbl. Pipe-Line Capacity

Present estimated pipe-line capacity out of the Permian basin, which includes fields in the Texas Railroad Commission Districts 7-C, and 8, and Southeast New Mexico, totals 618,000 bbl. a day. This may be expected to increase to around 620,000 bbl., or more, per day during the summer, due to summer temperatures. Plans for new lines and added capacity to existing ones will greatly increase pipe-line outlet during 1948. Included in the new projects are plans of Gulf Refining Co. to increase its line from 100,000 to 116,000 bbl. daily, and Stanolind Oil & Gas Co. to boost capacity on its Drumright, Okla., line from 85,000 to 125,000 bbl. daily.

Another major pipe line outlet, planned for operation about the middle of 1948, is The Texas Pipe Line Co., Shell Pipe Line Corp., and Empire Pipeline Co.'s 500-mile carrier between Jal, N. M., and Cushing, Okla., via Wink, Midland, Westbrook, and Wichita Falls, Tex. It will have a designed capacity of 150,000 bbl. of crude a day, and is said to be the largest oil pipe line to be constructed by private capital. Upon its completion, total pipe line outlet for the basin will approximate 825,000 bbl. of oil a day. For comparison, crude oil gathered from West Texas leases was reported to be 500,958, 504,482, and 519,833 bbl. daily, in each of the first 3 months of the year. Southeast New Mexico production for the same period averaged 101,279, 104,390, and 104,028 bbl. daily. Refining capacity in this area totals approximately 80,000 bbl. a day. However, April refinery runs were 64,000 bbl. daily.

Storage facilities at tank farms in West Texas and New Mexico total about 29,000,000 bbl. at the present time, and new tankage is continually being added. In view of the competition for new connections, pipe-line purchasers are trying, wherever possible, to avoid reducing their take below the allowable figure even though they cannot move it immediately by pipe line. As a result, much crude has moved to storage locally. In early May, about 17,000,000 bbl. of crude oil was on hand in tank farms at Midland, Kemper, Yates, McCamey, McElroy, Monahans, Wink, Andrews, Hobbs, Eunice, and other smaller installations. Some of the remaining 12,000,000-bbl. capacity will be pressed into use during the next several months, but greatly increased tank-car shipments may largely balance future additions in crude-gathering rates. Operators expect rail movements to continue until completion of new pipe-line facilities make them no longer necessary.

Existing trunk pipe lines serving the Permian basin:

Company	Size (in.)	Destination	Est. capac. (bbl. dly.)
Atlantic	10	Gulf Coast	41,000
Gulf (2)	10	Gulf Coast	100,000
Humble (2)	8	Gulf Coast	50,000
Humble (2)	10	Gulf Coast	61,000
Magnolia	8	Gulf Coast	22,000
Magnolia	12	Gulf Coast	66,000
Paso Tex	8	El Paso	24,500
Phillips	8	Mid-Continent	20,000
Shell	10	Mid-Continent	47,500
Shell	10	Gulf Coast	36,000
Stanolind	10	Mid-Continent	85,000
Tex.-N. M.	12	Gulf Coast	65,000
Total estimated capacity			618,000

this week

GOVERNMENT-INDUSTRY—Senate foreign-relations committee rejects request of Texas oil producers for postponement of hearings on the Anglo-American petroleum treaty and announces that supporters of ratification will be heard June 2 and 3 as scheduled. . . . Hearings may be open so that opponents may testify at a later date. . . .

PRODUCTION—Daily average crude production in the United States makes its twelfth consecutive weekly gain to reach another new all-time high of 5,041,745 bbl. . . . Last week's average, up 19,630 bbl. from the previous week, exceeds the June 15, 1946, record by 77,335 bbl. daily. . . . Gains are on a broad front with California, Kansas, Louisiana, Mississippi, New Mexico, and Wyoming all rising above their highest production levels of last year. . . . California production at a new peacetime high of 924,800 bbl. daily. . . .

SUPPLY—East Coast refineries reported studying wholesale use of coal for plant fuel to release badly needed fuel oil. . . . Mid-Continent heavy-fuel-oil market shows signs of leveling off with prices ranging around $2.25 per barrel. . . . Senate small-business committee plans investigation into tubular-goods shortages as a result of complaints from independent producers. . . .

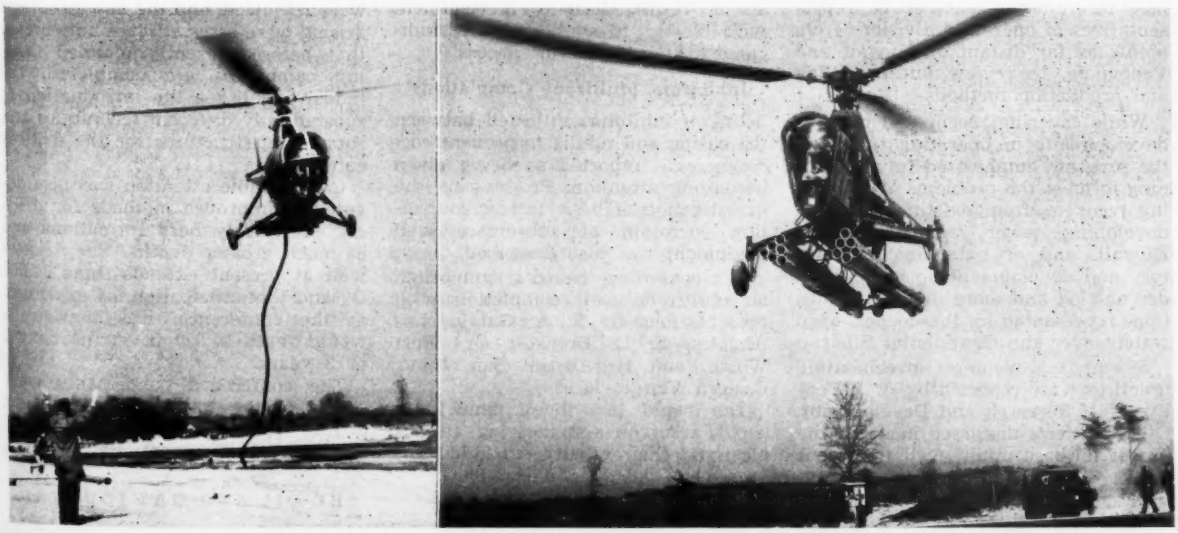
EXPLORATION—Continental's deepest test ever completed in Montague County, Texas, makes 159 bbl., 24 hours, from 6,018-38 ft. . . . ¶Stanolind's Lucky field discovery, Matagorda County, Texas, flows 79 bbl. pipe-line oil daily. . . . ¶Atlantic Refining well, Beauregard Parish, Louisiana, flows 113 bbl. 40°-gravity oil from 7,272-78 ft. . . . ¶Standard of Texas gives Alta Mesa field, Brooks County, Texas, new and deeper pay at 5,194-5,203 ft., flowing 77 bbl. 45°-gravity oil daily. . . . ¶World's deepest well, Superior's 52-11 Weller, Caddo County, Oklahoma, drilling below 17,700 ft. . . .

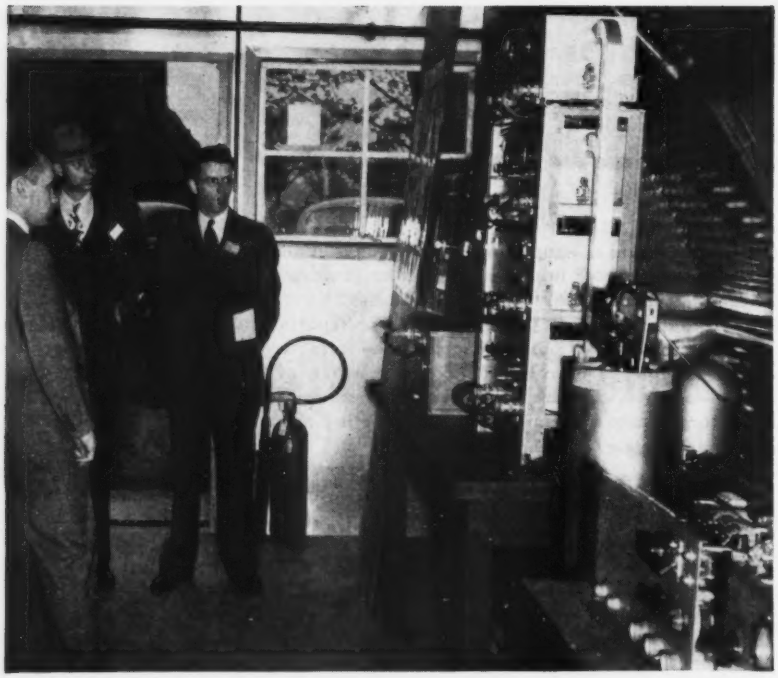
INTERNATIONAL—Reports indicate Jersey Standard. Socony-Vacuum may turn to high-cost Middle East imports to meet a shortage of crude from U. S. sources for East Coast refineries. . . . Possibility seen that companies may be importing about 20,000 bbl. daily by early fall. . . . ¶Lebanon and Syria reach agreement, paving way for locating Trans-Arabian pipe-line terminal in Lebanon. . . . ¶Mexican commission recommends five steps, including halt to products exports, to build up government-controlled oil industry. . . . ¶American British officials order United States equipment for geological tests in the Hanover area of Germany. . . .

LABOR—Deep Rock dispute in Oklahoma, Phillips strike in Texas Panhandle area settled. . . . Phillips settlement with A. F. of L. operating engineers ends 20-day shutdown which was crippling industry through a wide area. . . . Strike leaves Pure walkout major unsettled labor issue in the industry. . . . Pure strike affects three refineries with total charging capacities of about 90,000 bbl. daily. . . .

NATURAL GAS—FPC holds in decisions on two cases that producers and gatherers of natural gas selling to interstate transmission lines are not subject to the Natural Gas Act and thus under FPC jurisdiction. . . . Cases involve Fin-Ker Oil & Gas Producing Co. and the R. J. and D. E. Whelan partnership in Texas. . . . ¶Texas Eastern Transmission disclosed to be offering 8-cent maximum for Big Inch natural gas on a 20-year contract. . . . Company now closing deals for 75 per cent gas-field gas supply and surveying available flare gas to meet its 25 per cent commitment. . . .

On the theory that 80 per cent of the work involved in laying pipe lines in difficult terrain lies in road construction and similar activities, army engineers have been experimenting with Hx helicopters to carry pipe to remote areas. A length of fuel-carrying rubber hose is dropped by one of the helicopters in one experiment, while another craft prepares to jettison a load of 12 sections of pipe, 20 ft. long, in a simulated construction operation. (Photos by U. S. Army Signal Corps.)





At the first postwar production engineering conference of the Gulf companies, visiting engineers view the airborne magnetometer, developed in Gulf's research laboratories. In the picture are E. S. Hosford and A. C. Godbold, both petroleum engineers of Tulsa, and D. W. Reed, physics division, Gulf Research & Development Co.

Gulf Holds Postwar Conference For Production Engineers

PITTSBURGH.—More than 125 production executives and engineers recently attended the first postwar, company-wide Production Engineering Conference of the Gulf companies held May 12 to 17 at the laboratories of Gulf Research & Development Co., Harmarville, Pa. The meeting brought together 85 representatives of operating divisions from points as far distant as Kuwait and Venevuela, to review latest drilling and production methods.

While covering recent and postwar developments in operating practices, the program emphasized future planning to meet the problems of increasing recovery from existing fields, of developing newer regions, such as Kuwait, and of extending exploratory and development operations under untried and more difficult conditions represented by the deeper, open waters over the Continental Shelf.

Recent improvements in cementing practices were reported by A. J. Teplitz, Gulf Research and Development. Other subjects discussed included the use of oil-base muds, well treatment with plastics, and down-the-hole injection of inhibitors to lessen corrosion.

Use of plugging plastics in well treatment for water and gas shutoff was reported as beyond the experimental stage in many areas, particularly East Texas. A statistical analysis of results from well treatment with plastics to shut off water indicated a high degree of success.

Inhibitors, Multizone Completions

Use of inhibitors, injected between the casing and tubing to prevent corrosion, was reported as being given increasing attention. Progress on the investigation of basic factors controlling corrosion of subsurface well equipment was also described.

The conference heard a symposium on multizone well completion with presentations by E. A. Galvin, Los Angeles, E. D. Brockett, Jr., Fort Worth, and H. Austin, San Tome, Eastern Venezuela.

The rapid growth of knowledge about reservoir--engineering principles, and their greatly expanded application, was reflected in a number of papers. If complete reservoir-engineering data are gathered from the time of discovery, operations can be planned to achieve much higher efficiencies in recovery. The choice of completion interval, well location, and well spacing can only be made properly on the basis of such data.

Case histories of several fields were presented to illustrate the importance of detailed geological and reservoir-engineering analyses in interpreting the performance of a field. Particular attention was given to conditions in Venezuela, including the effectiveness of possible water drive from surrounding edgewater and also of gravity drainage in many Eastern Venezuela reservoirs.

Phase-Relation Studies

A summary of phase-relation studies on condensate wells was presented. It included data on reservoir conditions in 32 wells and more detailed production studies on nine reservoirs. It was shown that the relation between well performance and fluid composition or field data was complicated and could not, at present, be calculated with accuracy. However, it was demonstrated that by knowing the gas-oil ratio and reservoir temperature only, fair approximations to production characteristics of condensate reservoirs could be made.

Manifold problems emphasizing the need for unitized producing operations to effect the most efficient oil recovery were discussed in an informal symposium. Since gas injection, water injection, and cycling all require unitized operation for optimum results, the need for a greater standardization in the fundamental participation formulas of unitization agreements, and in the evaluation of the primary factors determining an operator's equity, was stressed.

Much attention was given by the conference to the significant problem of over-water drilling. Experiences to date with this type of operation in the Gulf Coast and in Venezuela were reviewed, and the new problems arising were assessed. It is anticipated that before presently planned drilling campaigns are completed, the industry will see the introduction of substantially different techniques and supporting structures for the drilling equipment.

Considerable attention was also devoted to improved methods for drilling excessively hard formations and at much greater depths. The deepest well at present extends some 17,300 ft., and the anticipation, as expressed at the conference, was that wells would reach 20,000 ft. in the next 2 or 3 years.

The conference participants were guests of the National Tube Co. on a tour of that company's National Works at McKeesport, Pa.

Maximum Propane Use Necessary, Warren Vice President Says

MAXIMUM utilization of propane, together with adequate storage, offers the only salvation in any effort to supply demand in the fast-growing liquefied petroleum gas industry, Howard Felt, vice president of Warren Petroleum Corp., said in a talk at the annual meeting of the Liquefied Petroleum Gas Association in Chicago this week.

Speaking on "Fuel Supply," Felt declared that the value and need for propane, once the "bothersome stepchild of the petroleum industry," is now obvious and that it is only a matter of the time necessary to install equipment and obtain transportation to make the increased production from present plants available.

"The reason I am emphasizing the maximum use of propane can be realized from the fact that today plants, which are designed to recover 95 to 100 per cent of butanes, only recover from 10 to 40 per cent of available propane," he said. "That is because to recover more, costs increase more per gallon. By this I mean that to recover more propane than the amount originally planned requires a larger plant all the way through, so that the cost of recovering each gallon above the original plants mount as the percentage of extraction incerases.

"It has not been so many years ago that butane did not receive much credit in the economic payout of a gasoline plant. When the war came along, butane was finally counted on for its money value but propane was incidental. Now with its value and apparent need to the industry, propane will assume its share of plant economics."

Four Lessons Learned

Full use of propane, either as such as in higher vapor-pressure mixtures, Felt said, is one of four lessons learned from the short postwar period in the development in the L.P.G. industry. Others, he said, are:

1. L.P.G. has apparently unlimited public acceptance for many of its purposes.

2. It is dangerous to count on supplies without adequate planning for distribution.

3. New uses and expanded old uses are developing more rapidly than available supplies can reach the markets.

In connection with L.P.G. supply, the Warren official said it is generally agreed that producers and distributors "cannot provide extraction and storage facilities on a year-round basis of sufficient capacity to meet peak winter requirements." Thus, he said, it is "imperative that every gallon produced be saved for its immediate or deferred use and that requires storage at the points of production and distribution. . . . The consumer must be relied upon to carry his part of the burden in larger tanks in his back yard. . . ."

The L.P.G. business, Felt said, will reach far greater proportions in gallons sold than it has today, and it cannot expand willy-nilly. "No longer can you just keep on expanding as it suits your individual setup," he told the L.P.G. dealers. "You are not dealing in the waste product or the byproduct of yesterday. You are dealing in a commodity of usefulness and value, and as in any other stable business, it will be necessary in the future to consult with your suppliers and be reasonably certain you can serve your customers adequately and make your invested capital return you a fair dividend."

New Tulsa A.C.S. Section Holds First Meeting

More than 200 members and guests attended the first meeting May 23 of the recently organized Tulsa area section of the American Chemical Society. Buell O'Connor, Stanolind Oil & Gas Co., section chairman, presided.

George Roberts, Jr., manager of Stanolind's research laboratory, discussed developments to date in the manufacture of synthetic gasoline. Roberts explained the German Fischer-Tropsch process, the forerunner of programs now under way in this country to manufacture motor fuel and other products from natural gas.

"Through the application of improved engineering and technology the American synthetic - gasoline process is much improved in efficiency over the German techniques," Roberts said. "In the present application, premium synthetic gasoline of approximately 80 octane can be produced in competition with natural petroleum products of equivalent quality, taking into consideration operation and amortization costs, with nautral gas at prevailing prices. It is currently indicated that the investment for a synthetic-oil plant is of the order of $3,000 to $3,500 per daily barrel of hydrocarbon product, which is less than half the corresponding figure for the German synthetic-oil plants." *(A description of the plant to be built by Stanolind was published in The Oil and Gas Journal, March 15, 1947, page 73).*

C. O. Willson, editor of The Oil and Gas Journal, spoke on "Some International Aspects of the Petroleum Industry." *(See page 114, this issue).*

Hallanan to Address Pennsylvania Group

Walter S. Hallanan, Pittsburgh, president of Plymouth Oil Co. and chairman of the National Petroleum Council, will be principal speaker at the twenty-third annual meeting of the Pennsylvania Grade Crude Oil Association in Hotel William Penn, Pittsburgh, Thursday, June 5.

Hallanan will speak at the annual banquet on "The Challenge We Face in Peacetime."

Other speakers and their topics at the 1-day meeting will be: Dr. R. V. Hughes, Bradford, director of production research of the association, "Recent Progress in Secondary-Recovery Research"; Dr. P. H. Price, Morgantown, W. Va., West Virginia state geologist, "The Future of Oil in West Virginia"; a representative of the Fred Eldean Organization, "The Petroleum Industry's Public - Relations Program"; Dr. John W. Frey, Washington, director of the American Petroleum Institute Marketing Division, "The Oil Marketer and His Industry"; Roy A. Foulke, New York, vice president of Dun & Bradstreet, Inc., "Economic Outlook for the Immediate Future"; Charles J. Wood, partner in Harry P. Dunn Co., Chicago oil marketers, "The Question—the Jobber"; and Dr. Thomas C. Poulter, associate director of Armour Research Foundation, Chicago, "Association Activities at Armour Research Foundation."

Research Project Is Transferred by Sun

A research project which seeks, through use of the isotope Carbon-13 as a tracer, to discover the reactions involved in the chemistry of animal and plant life, has been assigned to Temple University Research Institute by Sun Oil Co.

Arthur E. Pew, Jr., director, said the project is being transferred after 3½ years of work at the Linwood, Pa., laboratories of Houdry Process Corp. The project, he said, has been advanced to a point justifying its continuance by a specialized group.

Increased quantities of the rare isotope will become available for research, he said, when a plant capable of producing 500 grams a month is completed at Sun's Marcus Hook, Pa., refinery. Completion is expected in mid-July, Pew said.

International

WORLD-WIDE OIL DEVELOPMENTS

Persian Gulf Neutral Zones Attract Interest; Ownership in Doubt

WHILE rumors have again been revived that certain large independent United States oil companies are evidencing interest in two neutral zones in the Middle East, the logical question arises as to how concessions there might be obtained in view of certain preferential rights of Arabian American Oil Co., coupled with the fact that the three countries involved have never agreed to whom the land belongs.

One of these neutral zones lies west of Kuwait and borders on Saudi Arabia and Iraq (the Iraq-Nejd neutral zone), and the other is south of Kuwait and borders on this Sheikdom and Saudi Arabia (the Kuwait-Nejd neutral zone). Aramco holds preferential rights in both zones and Iraq Petroleum Co., Ltd., through an understanding which involves a blanket concession, holds rights in the Iraq-Nejd zone. Whether Kuwait Oil Co., Ltd., holds preferential rights in the Kuwait-Nejd zone is not clear.

In view of these preferential rights, actual and potential, it appears evident that the U. S. State Department —the prime mover in whipping up interest of independent United States oil companies in the Middle East—presumably would render its diplomatic assistance between countries and companies to effect some type of working agreement.

Both of these Middle East neutral zones are thought to lie in sedimentary areas, but little if any exploratory work has been conducted in either zone. The zones were declared neutral areas many years ago because of existing water wells, necessary to camel caravans crossing the deserts. And while friendly arrangements exist between the countries involved, in that no tribal fighting prevails, actual title to the areas remains undetermined.

Reports indicate that I.P.C. is again working with the Iraq Government to clarify its preferential rights in the so-called Iraq-Nejd neutral zone, although other reports imply that I.P.C. already has these rights under previous arrangements.

But whether United States independent oil companies ever push their interest far enough for the State Department to intervene, it is likely, according to well-informed sources, that I.P.C. might persuade the U. S. Government to help that company in clarifying rights to the Iraq-Saudi Arabian (Iraq-Nejd) zone, in Iraq's favor. This is because of the fact that the State Department played a highly important but indirect role, in 1928, in getting American oil companies into I.P.C. and because of the recent chain of events concerning the French Government's protest over the consummation of Aramco's expanded partnership with Standard Oil Co. (N. J.) and Socony-Vacuum Oil Co., Inc. One source in New York pointed out the Saudi Arabian king, or his successor, might be persuaded—presuming that Aramco and the State Department intervened—to open the doors to I.P.C in the Iraq-Nejd neutral zone. These and other far-reaching questions are being discussed and threshed out in London by directors and officials of Iraq Petroleum Co., Ltd.

Mexican Commission Recommends Export Ban, More Exploration

SUSPENSION of all petroleum products exports, an increased program of exploration, and conservation of natural gas have been recommended to the Mexican Government as moves necessary to prevent depletion of the nation's petroleum reserves.

A $365,000,000 program to build up the government-owned industry also was recommended. The recommendations were contained in a report submitted by a special commission named last December to survey the nation's oil industry and to make proposals for its improvement.

Pointing out that there has been little new discovery since the government took over oil properties from their foreign owners in 1938, the commission declared continued depletion of Mexico's oil supplies without the discovery and development of new fields will exhaust Mexico's reserves.

The commission recommended:

1. Increased efforts to locate new fields and development of newly discovered fields.

2. Construction of pipe lines from Poza Rica field, in Vera Cruz State, to Guadalajara, and from Minatitlan to Salina Cruz; construction of a $17,000,000 refinery at Guadalajara and expansion of existing refineries at Minatitlan and Ciudad Madero at a cost of $30,000,000.

3. An increase in the number of oil workers to enable the industry to carry out the program.

4. Suspension of foreign exports of petroleum products.

5. Utilization for industrial purposes of natural gas now wasted in existing fields.

Petroleos Mexicanos, government oil agency, announced several months ago plans to step up exploratory and development work and since then has announced signing of contracts with American drilling contractors for wildcatting in several states.

The special commission to study the industry was appointed in December following a short strike by the nation's oil workers. The strike was ended after President Miguel Aleman called on the Mexican army to halt it. The commission included representatives of the oil industry and the oil workers' union.

Oil Described as No. 1 Opportunity In South America

International
WORLD-WIDE OIL DEVELOPMENTS

SPEAKING before the monthly luncheon meeting of the Tulsa chapter of Nomads, May 21, Kenneth B. Barnes, engineering editor of The Oil and Gas Journal and its affiliated South American publication, Petroleo Interamericano, declared that oil was the No. 1 opportunity in South America.

Barnes recently returned from a 15,000-mile inspection trip of oil fields and refineries which took him into all but five of the 20 Latin-American countries. Accumulated at first hand from oil companies and government agencies were fact-by-fact listings of current activities from virtually every oil field, refining, and operating center in each country.

The over-all picture, Barnes said, is "one of phenominal growth with the majority of the oil areas promising to have most remarkable futures. Supplies and manpower are badly needed, but even with the present scarcity of these, new records are constantly being set."

The fast pace of Venezuela's oil operations, both in the Lake Maracaibo district and in the eastern areas, were described by Barnes, along with the 100 million dollar refinery-construction program of Creole and Shell on the Paraguana Peninsula. At Aruba, Barnes said, Lago Oil & Transport Co. is now refining 310,000 bbl. per day, while at Curacao Shell is processing 250,000 bbl. per day.

For Colombia, Barnes discussed the operations of the large El Centro, Barco and Casabe fields. Production runs some 65,000 bbl. per day from 1,400 wells. Colombia has two crude-oil trunk pipe lines to the Caribbean and two inland refineries.

Peru, whose first oil well was completed in 1875, continues to produce 35,000 bbl. per day from the four fields in the northwestern coastal territory. The largest single operation by far is that of International Petroleum Co. at Talara-Negritos. Here the company is building many housing units, refinery additions, and utility enlargements which will result in Talara becoming a model industrial community of the first order.

In Ecuador, Barnes stated, the fields of Santa Elena Peninsula continue to produce about 6,500 bbl. per day from 600 wells ranging in depth from 500 to 4,300 ft. The two refineries in the area process all the oil, with domestic consumption heavy. Most spectacular operation in the country is Shell's wildcat drilling on a 10,000,000-hectare concession in the Oriente region, east of the Andes. A half dozen planes are used, and the heavy-duty drilling rig was flown in across the high mountain chain.

Lebanon Expected to Get Terminal; Middle East Imports Studied

POSSIBILITY that Lebanon will be terminus of 31-in. trans-Arabian crude oil pipe line, and that both Standard Oil Co. (N. J.) and Socony-Vacuum Oil Co., Inc., will import relatively small quantities of Middle East oil by tanker from either Saudi Arabia or Iran, highlighted this week's international oil developments.

However, Tuesday the Jersey company issued a statement declaring the company "has no present plans" for bringing Middle East crude into the United States. "Because of the world-wide tightness in crude-oil supply, the company has had discussions with Persian Gulf oil producers looking toward spot purchases of some crude oil for supplying foreign markets if it were available," the Jersey statement said. "In the company's opinion, only a small amount of crude oil at best would be available above present commitments of producers in the Middle East. Expansion of production there depends on new facilities which cannot be completed for some time yet."

Reports earlier indicated that Jersey and Socony may be importing a combined total of approximately 20,000 bbl. of Middle East crude daily by early fall to meet the current United States shortage. Based on United States flag-tanker transportation, costs are about $1.35 per barrel. Assuming a well-head cost of around 56 cents per barrel in the Middle East, cost of laying down crude on the East Coast would be about $1.91.

Whether Lebanon will be the terminus of Trans Arabian Pipe Line Co.'s projected line is not yet known, but reports indicate that this subject was discussed in San Francisco at last week's meeting of Arabian American Oil Co. officials, as well as Jersey Standard's President Eugene Holman and Socony-Vacuum's President B. Brewster Jennings.

A satisfactory financial arrangement between Syria and the Trans-Arabian company is expected within days, an arrangement whereby Syria will share on a somewhat equitable basis the pipe-line revenue which will accrue through royalty payments and other capital expenditures. Syria and Lebanon reportedly have reached an agreement whereby both governments will share customs duties and other common income.

Dispatches from Beirut indicate that each country will receive an annual transit fee of $100,000 and a security payment of $80,000. Lebanon may get a 4-cent per ton payment on all oil exported and share this with Syria.

Caltex Rebuilding Plant Near Bordeaux, France

California Texas Co., Ltd., jointly owned by Standard Oil Co. of California and The Texas Co., is working in cooperation with the French Government to rebuild its 7,500-bbl. refining unit at Ambes, near Bordeaux, France.

The project is expected to have a marked effect on French refining operations, which were badly crippled during the war.

Through financial arrangements completed early this year, Caltex now has marketing outlets in 17 Eastern Hemisphere countries, covering the European area as well as North Africa. The new marketing operations mean greatly increased outlets "for the growing output of crude oil and manufacturing products from the oil fields and refineries of Saudi Arabia and Bahrein Island, operated by the parent companies of Caltex," according to the spring bulletin of Standard of California. "To the peoples of Europe," the publication says, "it means an additional source of fuel and power to supplement inadequate supplies of coal."

Colon Development Output

Venezuelan crude-oil production of Colon Development Co., Ltd. (Shell), for the 4 weeks ending April 28 was 354,311 bbl., or approximately 12,653 bbl. daily. This compares with Colon's 4-week output, ending March 31, of 376,941 bbl., or approximately 13,462 bbl. daily.

U. S. Technical Leadership, Increasing Demand Feature Today's World Oil Outlook

by C. O. Willson

ANY discussion of the international petroleum situation should start at home.

This country, beginning with the Drake well, quickly became the most important oil-producing and consuming center of the world. Today we have about 63 per cent of the global oil production and a fractionally higher percentage of the world's demand. In addition nationals of this country own at least 35 per cent of the proven oil reserves outside this country exclusive of Russia. This country's "know-how" of petroleum techniques is even more dominant in world petroleum activities than its supply and demand position. The practical arts of finding, producing, refining, transporting, and distributing petroleum are essentially an American enterprise; that fact has been of major importance in international oil trends in the past and will continue to be in the postwar adjustment period now under way. The manufacture and sale of petroleum equipment and materials is an integral part of our industrial economy, and their utilization in all divisions of oil operations has not been seriously challenged in any part of the world. The dependence on American techniques and manufacturing facilities in all divisions of oil operations probably is the most important single factor in the international oil situation at this time.

International
WORLD-WIDE OIL DEVELOPMENTS

This is a part of a talk on some aspects of the international petroleum situation, given by C. O. Willson, editor of The Oil and Gas Journal, May 23, before the Tulsa section of the American Chemical Society.

In November 1944 the editorial department of The Oil and Gas Journal presented a special section dealing with the postwar outlook. It was largely based on the views of those who had already expressed opinions, and estimates which we obtained from various sources, including Washington agencies. What has happened over the past 21 months has proved that these estimates were far too low. It has not been until recent weeks that students of this industry have come to realize what is actually taking place in petroleum demands throughout the world. Contrary to predictions the decline in domestic and world oil needs after V-J Day was small in volume and proved to be of brief duration. The 1946 overall consumption early in the year was slightly less than the war peaks of 1945, but when the half year ended we began consuming more petroleum than ever before. This trend has been accentuated by the amazing increase of the past winter and the still greater requirements now accepted for the remainder of this year and 1948.

Our pool of opinion in the closing months of 1944 indicated that by 1950 the domestic and export demands would total 1,900,000,000 bbl. The demands of last year exceeded that 1950 projection by 55,000,000 bbl. and this year's demands will exceed the 1950 estimate by approximately 275,000,000 bbl.

In this connection the latest demand and supply reports of the Bureau of Mines covering January-February 1947 domestic activities, when studied in the light of subsequent developments, are of special interest. This shows the following increases over the same period of 1941: Motor fuel, 17.4 per cent; kerosene, 31.6 per cent; distillate fuel oil, 43.5 per cent; residual fuel oil, 27.2 per cent, and lubricating oil, 9.6 per cent.

Demand at Record Levels

The demands of distillate consumers, centering in heating oils and diesel fuels, threaten this coming fall and winter to exceed the available supply. The competitors of petroleum—the coal industry and allied interests—with their strikes and other operating difficulties, have added hundreds of thousands of new customers to the oil industry in this country. Burning oils and heating oils are no longer byproducts of our petroleum operations, but are primary products and must be considered as such. The demands for asphalts, coke, wax, liquefied gases, and a large list of specialty products are at all-time peaks.

Now in regard to supply. To take care of demand of 5,977,000 bbl. daily the first 2 months of this year we produced 5,086,000 bbl. daily of crude

A two-fold increase in production from the prolific fields of the Middle East is anticipated over the next 5 years. Output in 1946 was slightly over 700,000 bbl. daily. Above is a scene in Abquiq field in the Saudi Arabian concession in Arabian American Oil Co. Abquiq's reserves are estimated to exceed 3,000,000,000 bbl.; the field is now producing more than 90,000 bbl. daily

oil, natural gasoline, and associated products. To make up the difference of 911,000 bbl. daily between domestic production and total demand we had to import 475,000 bbl. daily and draw on stocks at the rate of 416,000 bbl. daily. Some of the reduction in inventories was seasonal but withdrawals over-all were greater than they should have been to maintain a healthy relationship between supply and demand.

U. S. the World's Major Consumer

Some of you probably have wondered why so much time is being given to an outline of petroleum conditions in this country in a discussion concerned with international petroleum conditions. The answer, I hope, is now obvious. The 140 million people of this country consume almost twice as much petroleum as do the remaining 2 billion people of the world. Prewar, the expansion in our domestic supplies kept pace with steady increase in consumption. But our field output has not paralleled the surprising increases in demand of the past year. We have increased our imports so that they now exceed our exports. We have expanded our domestic production substantially since March 1, but we are still dependent on outside oil production for an important part of our total demand.

So the second aspect of the international petroleum situation is the fact that we enter directly into world oil affairs as a buyer of crude oil and products to supplement our own production. That situation will not change in the immediate future. There is little fluff in our present greatly expanded consumption of petroleum products. Further increases, not decreases, are in prospect. Ours has become a petroleum economy and any forced curtailment of use not only will lower our standard of living, but will weaken our efforts to direct world affairs at this critical period. We must have petroleum in increasing quantities, and in our relations with other peoples that fact is of primary importance.

Prewar Excess Capacity Gone

What we can do in increasing petroleum supplies within our own boundaries no one knows. Fortunately, prewar we had large reserve supplies on which we drew while output was being expanded during the emergency. We had neither the manpower, the materials, nor the price inducement to maintain maximum field operations during the war period, and we now no longer have large supplies in fields producing below the maximum efficient rate of production on which to draw at this time. We have returned to normal operating conditions and we should know within a reasonable period whether new supplies can be found in this country to take care of the assured further expansion in demand and at the same time build up a field reserve sufficient for another possible emergency.

The latest report of world supply and demand with a projection to 1951 was presented by H. W. Page, head of coordination and economics department of Standard Oil Co. (N. J.) at the May 8-9 meeting of the Independent Petroleum Association of America, Jackson, Miss. A summary of his analysis is given in the accompanying Table 1.

This table points to several conditions in our international petroleum situation which are of interest. It shows that while our gains in demand over the next 5 years will be large, the percentage increases in the remainder of the Western Hemisphere will be larger and those of the Eastern Hemisphere (excluding Russia) still greater. In actual volume, the gains in this country for the 5-year period will be slightly greater than those of the rest of the world.

In regard to supply this analysis by the largest domestic and international oil company projects only a 10 per cent increase in United States production over the next 5 years, with gains of 31.2 per cent in the remainder of the Western Hemisphere and 103 per cent in the Eastern Hemisphere. In refinery crude runs to stills it is predicted that the increase will be 14.8 per cent in the United States, 35 per cent in the remainder of the Western Hemisphere, and 77.2 per cent in the Eastern Hemisphere. This means that 50 per cent of the increased world oil production by 1951 will come from the Eastern Hemisphere and the remainder about equally divided between this country and the remainder of the Western Hemisphere.

So we have another aspect of the international petroleum situation which points to a condition in which the Eastern Hemisphere, with its vast potential markets, will become more and more independent of the Western Hemisphere for its petroleum supplies. This in effect means that the Western Hemisphere supplies will have to be balanced against its demands.

Supply

This discussion of supplies outside the United States will be confined to Venezuela, and the Middle East and Near East of the Eastern Hemisphere. In 1946, Venezuela's production averaged 1,064,900 bbl. daily, an increase of about 100 per cent from prewar, while that of the Middle East and Near East was 824,000 bbl. daily, more than double the prewar production. Last year these two areas accounted for 76 per cent of the world's oil, exclusive of the United States and Russia. It is now certain that over the next several years, during which

TABLE 1—SUPPLY AND DEMAND—WORLD (EXCLUDING RUSSIA)*—1946-1951

	Barrels daily		% over
	1946	1951	1946
Demand:			
United States	4,907,000	6,025,000	+22.8
Western Hemisphere (exc. U. S.)	820,000	1,080,000	+31.7
Eastern Hehisphere (exc. Russia)	1,527,000	2,288,000	+49.8
Total	7,254,000	9,393,000	+29.5
Supply:			
United States production (crude, natural, etc.)	5,070,000	5,576,000	+10.0
Western Hemisphere (exc. U. S.)	1,445,000	1,896,000	+31.2
Eastern Hemisphere (exc. Russia)	964,000	1,957,000	+103.0
Total	7,479,090	9,429,000	+26.1
Refinery runs:			
United States	4,740,000	5,440,000	+14.8
Western Hemisphere (exc. U. S.)	1,206,000	1,628,000	+35.0
Eastern Hemisphere (exc. Russia)	975,000	1,728,000	+77.2
Total	6,921,000	8,796,000	+27.1
Net movement—Western to Eastern Hemisphere (exc. Russia)	640,000	367,000	—42.7
Exports from United States	414,000	250,000	—39.6
Imports into United States	370,000	699,000	+88.9

*In addition, United States exports to Russia are 8,000 bbl. per day in 1946 and 1947

TABLE 2—SUMMARY OF MIDDLE EAST OPERATIONS

Company and nationality of ownership—	Location of concession	Active fields	Active wells	Production (bbl. dly.)*
Anglo-Iranian Oil Co., Ltd. (English)	Iran	6	65	410,000
Arabian American Oil Co. (American)	Saudi Arabia	3	46	220,000
Bahrein Petroleum Co., Ltd. (American)	Bahrein Island	1	62	23,000
Iraq Petroleum Co., Ltd. (American, English, Dutch and French)	Iraq	†2	†11	96,000
Kuwait Oil Co., Ltd. (English-American)	Kuwait	1	8	40,000
Total		13	191	789,000

*Does not include observation wells and inactive wells. †Includes one well of the Anglo-Iranian Oil Co., Ltd., in the Naft Kaneh field producing 6,000 bbl. daily.

our political and economic observers tell us the trend of global events for this postwar generation will be determined, the world will look to this country, Venezuela, the Middle East, and Russia for the great bulk of its all-important oil supplies.

The "Good Neighbor" Policy

The oil situation in Venezuela and all Latin-American countries is part of what we have come to label as our "good neighbor" policy in our association with our neighbors to the south. The long-range economic objective is to establish sound trade relationships which involves greater imports from those countries to us and more exports to them. At present they require large imports of capital goods with which they can expand their agricultural activities and their industry. In addition to petroleum there is a long list of South American products which either are not produced in this country or not in sufficient quantities to satisfy our requirements.

Assuming stable political conditions throughout this hemisphere, there appears to be no basic obstruction which would prevent a closer association in our economic and cultural associations of benefit to all the peoples concerned and arising from a mutual interdependence.

Now we come to the petroleum of the Middle East, the most important single factor in the rehabilitation of the war-devastated Eastern Hemisphere and in the opinion of many competent observers, the big "if" in the plans to establish a prolonged peace.

In Table 2 is a brief summary of Middle East operations based on the latest information available.

The data presented do not include the production of Egypt, of 25,000 bbl. daily in two fields. This production is owned by the Anglo-Egyptian Oilfields, Ltd., which is controlled by the Shell interests. In Qatar on the Persian Gulf a field is shut in with two wells which indicate a large proven reserve. Many of you are familiar with the changes under way in Middle East oil and those planned for the future. These programs are the basis for the projection previously referred to in which it was predicted that the crude-oil output of the Eastern Hemisphere (excluding Russia) would be doubled by 1951.

Middle East oil is staggering in its potentialities and sobering in its significance in shaping the future course of world events. It is agreed that the search for oil in the Middle East and in adjoining areas, where comparable geological conditions exist, has only started with every reason to believe that future discoveries will exceed those already completed. The development of the present known reserves does not stop with field development and pipe-line transportation but means that hundreds of millions of dollars must be invested in new refining and marketing facilities over the next few years.

Implications of Middle East Oil

Middle East oil readily can be made available to the east and to the west. To the peoples of Western Europe and the United Kingdom it offers for the first time in history fuel and power at prices and in quantities which should enable those areas to advance and stabilize their economies so that their living standards will be comparable to ours.

To the underprivileged peoples—and that expression is used in a very real sense in the Eastern Hemisphere—this Middle East oil offers the opportunity for relief from an economic darkness which has changed little in many centuries.

There are many crosscurrents in these aspects of today's international petroleum situation. But they must not be permitted to obscure the vital significance of Middle East oil which lies in its utilization for the peaceful pursuits of mankind in that part of the world which too long has been dominated by national rivalries based on uneven and inadequate living standards.

FPC Rules Producer Selling to Interstate Line Not Subject to Gas Act

WASHINGTON.—A positive finding that a producer and gatherer of natural gas who sells to an interstate transmission line is not subject to the Natural Gas Act has been made by Federal Power Commission in two cases decided simultaneously.

The more important of the pair involves Fin-Ker Oil & Gas Producing Co., which supplies nearly all the gas for Kansas-Nebraska Natural Gas Co., Inc., in Hugoton field in Kansas. The case had been pending before FPC since May 8, 1942, but was not settled because of various unrelated matters which became involved in it. The commission now states unequivocally that it has no jurisdiction over a company which, like Fin-Ker, produces and gathers gas and sells it within the same state, after gathering has been completed, to a nonaffiliated transmission company in an arm's-length transaction.

At the same time FPC dismissed with a memorandum opinion an inquiry from R. J. and D. E. Whelan as to their status under the act. The Whelan partnership owns some 3,373 acres in Whelan gas field, Harrison County, Texas, and proposes to construct gathering lines to connect with the interstate main of Texas Eastern Transmission Co. where it will dehydrate and meter the gas and sell it in an arm's-length transaction. The commission said that on the basis of the information supplied in the inquiry the partnership would not come under the act and is not subject to any regulation by FPC.

The Fin-Ker company controls about 50,000 acres in the northern part of Hugoton field in Finney and Kearny counties, Kansas, produces from 44 wells, and operates its own gathering system. It sells some gas to Northern Natural Gas Co. for resale within Kansas, but most of it to Kansas-Nebraska for interstate transmission. In 1942 Fin-Ker asked FPC to issue it a certificate as a natural-gas company under the act. At that time there was a complicated contractural relationship involving Fin-Ker, Kansas-Nebraska, Tri-County Gas Co., and Kansas Natural Gas, Inc. After several proceedings before the commission, Kansas-Nebraska purchased certain facilities of the latter two concerns, leaving Fin-Ker as an independent supplier of the trunk line.

Not "Natural-Gas" Company

In dismissing the application and ruling that Fin-Ker is not a "natural gas company" under the act, FPC declared that it is following a consistent line of decisions excluding "production and gathering" from its jurisdiction, starting with the Columbian Fuel Corp. case in 1940, which the commission stated is still controlling.

The opinion takes pains to distinguish between the facts in the Fin-Ker case and those in the controversial Interstate Natural Gas Co. case which is now pending before the Supreme Court. In the Interstate case, it explained, the company's "production and gathering" activities were held subject to jurisdiction because (1) the company was already an interstate transmission company by reason of other activities; (2) it had successfully maintained in the courts that its production and gathering activities were interstate commerce and not subject to state regulation; (3) it sold gas to affiliated companies which together controlled most of the gas in the area so the transactions were not "arm's length," and (4) it purchased and transported some of the gas before delivering it to others. None of these conditions, FPC said, are present in the Fin-Ker operations, and this concern is simply a producer and gatherer and is not subject to federal regulation.

New officers elected at spring meeting in Amarillo of the Division of Production, Mid-Continent district, American Petroleum Institute: R. P. Moscrip, vice chairman for Kansas, Shell Oil Co., Inc., Wichita; J. R. Phillips, vice chairman for Panhandle area, independent operator, Borger, Tex.; W. L. Horner, chairman, Barnsdall Oil Co., Tulsa; J. H. Field, vice chairman for Central Oklahoma, Sohio Petroleum Co., Oklahoma City; J. H. Abernathy, secretary-treasurer, Big Chief Drilling Co., Oklahoma City

Drillers Must Drill as Never Before, Thompson Tells A. P. I.

by Leigh S. McCaslin, Jr.

AMARILLO, Tex.—The challenge to the petroleum industry today is to see that no one in the United States is short of heating oil or gasoline, Col. Ernest O. Thompson, chairman of the Texas Railroad Commission, told over 400 assembled oil men at the spring meeting of the Mid-Continent district of the A.P.I.'s Division of Production, here May 22-23. Speaking at the windup banquet of the meeting, Colonel Thompson emphasized conservation and price incentive for wildcatters as ways for the industry to meet this challenge.

In his forceful talk, the colonel stated: "It's up to the drillers to drill as never before; the wildcatters must find more new fields. Never has the incentive been greater. After World War I, the price of crude oil went to $3.50 a barrel and the discoveries followed with great success, culminating with the finding of the vast East Texas field 16 years ago.

"It is only logical to believe that an adequate price today again will furnish the incentive to find the oil we are going to need. Price is the greatest discoverer of oil just as price is the greatest conservation agent. People do not waste that which is of value enough to conserve."

Colonel Thompson's banquet address concluded a 2-day meeting of the A.P.I. group which heard eight technical papers covering such diverse subjects as drilling, well completion, reservoir engineering, unitization, and water flooding. At the opening session, Don Emery, vice president and general counsel, Phillips Petroleum Co., Bartlesville, Okla., gave an address on "State Cognizance of Federal Power," and Don E. Gilman, executive vice president, Western Oil and Gas Association, Los Angeles, spoke on "The Petroleum Industry's Public Relations Program."

Emery emphasized the need for clarification of the production and gathering exemption of the Natural Gas Act through a congressional enactment, such as pending H.R. 2185, rather than by administrative rule and regulation. He added that "the industry must stimulate state governments constantly to recognize that natural gas is produced for consumers who, though willing to pay for the dry holes as well as the producers, will seek refuge in the halls of Congress if the producing states ignore their interests after inducing the Congress to forego the exercise of its protective power."

Main Job Is Industry's

Gilman, after discussing the intensive public-relations program which has been organized by the oil industry, declared that the main point he wanted to make to producers was that "the biggest job in this entire public relations program belongs to those in the oil industry itself. There are a million and a quarter employed in this industry. What we say to our families, to our friends, to our business acquaintances, carries greater weight than anything they see in print or hear over the radio. So from now on we want oil men to start talking shop for all they're worth."

R. C. Kay, independent operator of Amarillo, was chairman of the general arrangements committee for the 2-day meeting and was assisted by J. B. Parrott, Trinity Portland Cement Co., Amarillo, as vice chairman.

Officers of the Mid-Continent district, A.P.I. Division of Production, for the coming year were elected by the membership at the Friday meeting. W. L. Horner, Barnsdall Oil Co., Tulsa, was chosen as the new chairman succeeding Harold S. Kelly, Phillips Petroleum Co., Bartlesville, Okla., who was chosen new chairman of the advisory committee. Other new officers are: R. P. Moscrip, Shell Oil Co., Inc., Wichita, vice chairman for Kansas; J. H. Field, Sohio Petroleum Co., Oklahoma City, vice chairman for Oklahoma; J. R. Phillips, independent operator, Borger, Tex., vice chairman for the Panhandle; and Jack Abernathy, Big Chief Drilling Co., Oklahoma City, secretary-treasurer.

Oil-Burner Control Lifted

WASHINGTON.—Oil burners of 6 gal. or less hourly capacity are included in an announcement of the Office of International Trade, Department of Commerce, listing a group of commodities for which export licenses will no longer be required after June 1.

Mission Offices Moved

Mission Corp., which holds about 60 per cent of Skelly Oil Co. stock, about 20 per cent of Tide Water Associated Oil Co. stock, and is engaged in oil production in Mid-Continent and Texas fields, has moved its executive offices from New Jersey to Reno, Nev.

WASHINGTON WATCHING

BY HENRY D. RALPH

Treaty Hearings Scheduled

WASHINGTON. — Hearings on the long-pending Anglo-American petroleum treaty were scheduled for June 2 and 3 by the Senate committee on foreign relations last week. The committee has rejected requests of Texas independent producers that the hearings be postponed but indicated they may be held open to give opponents a chance to appear later.

When the hearings on the treaty are held, representatives of the State Department, Interior Department, and Army - Navy Petroleum Board will testify for ratification, and support will be asked of several of the oil-industry executives who acted as expert advisors during the drafting. Time will also be allotted to opponents, and it is expected that a number of oil men will testify in this role.

The treaty is designed to be a sort of code of fair practices between the two nations most involved in the world's petroleum trade, and to set standards for operations in foreign countries. It would create an International Petroleum Commission to make studies and advisory reports, but with no control powers.

Though simple on its face, this treaty has been the object of much misunderstanding and controversy. It was first negotiated between the State Department and British representatives in Washington in the spring of 1944 as an executive agreement rather than a formal treaty. Because of protests from the U. S. oil industry and numerous senators it was submitted to the Senate for ratification as a treaty. The opposition continued, and President Roosevelt withdrew it. The following year Secretary of the Interior Ickes headed a new delegation to London for further negotiations, and a new version was signed, which was submitted to the Senate in November 1945.

Grounds for Opposition

The original draft was opposed by much of the oil industry on the ground that its language was vague and could be interpreted to open the way for an international cartel and federal regulation of the domestic industry. The revised draft, however, met general approval at first. Later, doubts began to arise, and these were heightened last fall when State Department officials made public statements suggesting that further regulation of the international petroleum trade was in the offing.

Denials failed to convince everyone, and some oil trade associations are now on record as opposed to the treaty in any form while others are pledged to insist on reservations. More recently questions have been raised as to how the oil treaty may fit into the United Nations and subsidiary organizations, and whether it may not become a cog in a larger administrative machine for regulation of world trade. All these matters are expected to be threshed out before the Senate committee which obviously has not been very enthusiastic about the treaty from the start.

Needs of the Military

FUELS and lubricants which will perform satisfactorily in extremely hot and extremely cold climates are badly needed by the Army and Navy, according to Charles F. Kettering, chairman of the National Inventors Council, an organization sponsored by the Department of Commerce.

The council recently listed 25 research projects which the armed forces would like to have industry conduct or independent inventors develop. Among these are new types of fuels, lubricants and additives for extreme weather conditions, particularly arctic service. The Army and Navy are conducting tests in this field, but to date the results are not entirely satisfactory.

What is wanted particularly is a diesel oil which will not lose its physical and chemical characteristics at —60° F., a lubricating oil with a pour point of —60°, and a grease which will not solidify at —65°. It is also suggested that a solidified or jellied gasoline would be safer to transport and store provided it could be liquefied by a catalyst at a temperature below freezing.

Among the other inventions requested were a low-horsepower gas turbine; an ultralight-weight, small-horsepower gasoline engine; and a light-weight, high-speed diesel engine.

Future of Synthetic Rubber?

THE administration program for the future of the synthetic rubber industry is expected to be ready for consideration by Congress within a few weeks, and with it goes the fate of the petroleum butadiene industry.

Last spring when Congress extended the present program until March 31, 1948, it stipulated that permanent legislation should be drafted during the present session, and a subcommittee of the House armed services committee is anxious to get started. But first the Army-Navy Munitions Board is trying to get substantial agreement among government agencies and the industries affected, and a number of hitches have developed.

Rubber-industry representatives on the ANMB rubber advisory committee, for the most part, are anxious to be free to use as much natural crude rubber as they desire. They don't want to be forced to use large percentages of synthetic, so they would prefer to have the Government hold the synthetic plants in standby condition for an emergency. The so-called Batt report of the now extinct inter-agency rubber-policy committee recommended that a minimum of 250,000 tons of synthetic be produced annually, but most rubber men think about half this is enough.

Armed Services Fear Delay

Oil-industry men on the ANMB committee, however, point out that a single butadiene plant could produce enough for that much rubber, and that when a large facility like a petroleum butadiene plant is held in standby condition it may take as long as 6 months to get it going again. This disturbs the armed services, who don't want to run any risk of being caught in another rubberless emergency.

Further meetings are being held, and ANMB also has an intragovernment committee at work rounding up the views of various federal agencies. A tentative bill is scheduled to be whipped into shape soon so that the House committee can start to work. Because of the lateness of the session it is doubtful that legislation can be completed this year, but hearings will be conducted during the recess, probably next fall, with the view to having a bill in shape for passage early in 1948.

Antitrust Activity Looming

A CONSIDERABLE increase in antitrust activity in the oil industry is looming on the horizon.

The Department of Justice is receiving a number of complaints from jobbers that they are being denied fuel-oil supplies by major refiners and that the majors are even cutting off supplies from independent refiners by contracting for the entire output from these sources. Similar complaints are also reaching the Senate small-business committee, which may order an investigation. The trend

among large fuel-oil producers seems to be to promise deliveries only to customers who had contracts last year and to limit supplies to 10 per cent above 1946 purchases. If this practice becomes universal it is certain to bring loud complaints from those who can find no supplies, and will bring further charges of illegal allocations of markets.

The Justice Department is also readying another exclusive dealing suit, this time against a major marketer on the Atlantic Coast, similar to those recently filed on the West Coast against Standard Oil Co. of California and Richfield Oil Co. The charge is that ostensibly independent filling-station operators are coerced into handling exclusively a full line of accessories and other items favored by the gasoline supplier.

Another type of antitrust suit may be filed soon in Idaho in answer to Senator Dworshak's complaint about the recent increase in gasoline prices in his state. This probably will allege that distributors in Idaho have tacitly —and illegally—agreed to "follow the leader" in setting uniform prices and dealer margins.

Meanwhile the 7-year-old "Mother Hubbard" suit against the A.P.I. and all majors will get a day in court before long. On June 20 Sun Oil Co. must file with the District of Columbia federal court its answer to the Justice Department's objections to answering Sun's interrogatory as to just how it is suspected of committing all the violations of the antitrust laws charged in the 1940 complaint. Next step will be for the court to hear arguments on this matter. These arguments may be limited to legal technicalities involving the interrogatory, or they might open up the entire subject of why the Department has kept this case on the docket for 7 years without doing anything about it.

Government Contracts

THE Government's difficulties in getting contracts to supply it with petroleum products may be due to faults of both the oil industry and the Government, it developed at an exploratory conference last week among representatives of the Army, Navy, and Bureau of Federal Supply and a subcommittee of the NPC committee on government requirements.

The government procurement officials took the attitude that industry should put government needs first and foremost and should do everything needful to see that military and civilian agencies get the oil they want without difficulty. To this the industry spokesmen countered that the Government is not a very desirable customer because of all the red tape involved in its procurement procedures. They asked the Government to simplify its buying and adopt commercial practices, make long-term commitments, and give a more detailed breakdown of what products it will need and when and where.

The upshot was that both parties decided to see what they could do about the problem and meet again soon. The government men promised to try to meet the industry's criticisms, though they pointed out that much of the red tape is required by statute. The industry men agreed that something will have to be done to keep the Navy ships, the post office trucks, and other fuel-consuming government activities in operation, even though this business may be less desirable than the presently overabundant commercial demand. Just how the industry will meet its collective obligations to keep the Government supplied is a problem to be worked out within the next few weeks.

Rizley Supporters Cheered

PROPONENTS of the Rizley natural gas bill are much encouraged over the prospect of getting final action at this session of Congress as a result of the decision of the House interstate commerce commission in reopening hearings for May 28 and 29.

Back of this reopening is a minor revolt within the committee, involving many matters in addition to the gas bill. It seems that the new chairman, Rep. Charles A. Wolverton of New Jersey, has been working the committee according to his own schedule during the entire session. No executive sessions were held and no subcommittees appointed, and the entire committee was kept in almost daily session holding hearings on bills which the chairman thought most important. Because of this schedule the committee failed to complete action on any of the important measures before it.

Last week the members read the riot act to their chairman, according to grapevine reports, and refused to take up a new bill on railroad retirement, which many members oppose. They insisted that some of the other measures be cleaned off the calendar first.

As a result the Rizley bill will be taken up again and opposition witnesses be given a chance to testify, as they were promised at the time the gas industry completed its case. Members of Federal Power Commission and spokesmen for coal and rail interests will be heard, and possibly representatives of state utility commissions.

Gas-bill supporters on the committee were particularly incensed at what they believed to be delaying tactics on the part of the committee's expert staff. These men were assigned to edit, summarize, and analyze the testimony so far presented. They were presumed to do an impartial job but, according to reports, they displayed a distinct lack of sympathy for the Rizley bill, which added ammunition to the blowup in the committee last week.

There have also been rumors that somebody (just who was never identified) was engineering a compromise bill which would make it perfectly clear that Federal Power Commission has no jurisdiction over production and gathering of gas but would omit other and more controversial provisions of the Rizley bill. The pro-Rizley cohorts quashed this talk promptly. On the final showdown some changes in language may be accepted, but they are not ready to talk compromise at this stage.

The present outlook is for the bill to get a favorable report from the House committee, get on the House calendar, and then be sent over to a receptive Senate. That is the optimistic view. The vagaries of the legislative process, and the urge for recess which will accompany Washington's first real summer weather could easily upset this cheerful prospect.

Shortages May Be Probed

SHORTAGES of oil-country tubular goods may be investigated by the Senate small-business committee in the course of its current inquiry into the steel situation.

Complaints are being received from independent producers that they cannot obtain sufficient supplies of badly needed steel products, and the committee may hold hearings on this subject.

At present the committee is receiving testimony on the difficulties of small steel fabricators in obtaining structural shapes, sheets, plates, and other types of steel. It is looking into the black market, or "gray market" in steel, and may also probe the export situation.

Steel producers say that since government allocations were ended they are attempting to make deliveries on the basis of the historical consumption by areas and customers and that the gray market is a very small factor. However, many small users have testified that they have been offered odd lots of steel by brokers at prices much above the market list price. It is variously charged that some of this steel was diverted by the producers (for a "cut" to certain officials) or by customers who did not use their entire allotments, but the chief trouble apparently comes from what is known in the trade as the "daisy chain." This is the practice of brokers, many of them the fly-by-night variety, buying and selling steel to each other so that by the time final delivery is made (if ever) the price has been padded by a series of "commissions."

PERSONALS

Pure's New Production Head a 25-Year Veteran

COMER PLUMMER, Pure Oil Co.'s new vice president for production, has had a varied career of more than 25 years in producing and related operations of the oil business.

Plummer was born at Huntsville, Tex., November 21, 1892. During the first World War, he served with the Navy in European waters, in London, and at a staff office in Paris, subsequently working in the Navy Department in Washington as a yoeman. He entered the oil business in 1922 when he went to work for Humphreys Oil Co. which was later absorbed by Pure. His first job was stenographer-clerk in the legal department.

Plummer became in succession chief clerk to the division manager, roustabout, and roughneck and in the Mexia and Powell, Tex., fields, scout and landman, assistant land agent, assistant manager of the Texas division, assistant to the manager of the southwestern division; and southwestern division manager.

In 1931 he went to Chicago as assistant to R. W. McIlvain, vice president and general manager of production. In a reorganization in April, Plummer was made vice president for production while McIlvain became vice chairman of the company's new executive committee.

W. H. Mengden is preparing to move soon from Houston to Caracas, Venezuela, where he will be in charge of the operations to be carried on by Superior Oil Co. of California from offices being established at both Caracas and Bogota, Colombia. Mengden has been serving as head of the land department for Superior at Houston.

John F. Lynch was elected president of La Gloria Corp., Corpus Christi, Tex., at a recent stockholders' meeting. He succeeds the late Robert T. Wilson. Lynch also is a director of Carthage Hydrocol, Inc., New York, and president of Reynosa Pipe Line Co., Corpus Christi. Other officers elected are **T. S. Scibienski,** vice president; **P. R. Haas,** vice president and treasurer; **D. Philips,** secretary; and **T. E. Wilson** and **H. G. Nebeker,** assistant secretaries. Newly elected directors are **C. E. Wilson, John J. Sheerin, T. E. Wilson, E. F. Johnson, Binford Arney, Guy C. Kiddoo, Scibienski, Haas,** and **Lynch.**

Charles G. Carlson, consultant, was elected president of the Tulsa Geological Society at the group's annual meeting May 26 to succeed **J. G. Bartram,** assistant exploration manager of Stanolind Oil & Gas Co. Also elected were **Jerry E. Upp,** Amerada Petroleum Corp., first vice president; **L. E. Fitts, Jr.,** Sinclair Prairie Oil Co., second vice president; and **V. L. Frost,** Ohio Oil Co., secretary-treasurer.

G. L. Goodpasture, subsurface-pressure analyst for Shell Oil Co., Inc., Odessa, Tex., has been promoted to production foreman and transferred to Hobbs, N. M. Other Shell promotions and transfers, principally in the Texas-Gulf Coast area, include: **A. Boring,** from senior draftsman to chief draftsman, exploration, Midland, Tex.; **C. A. Dauterive,** from senior draftsman to engineer, land, Houston; **F. W. David,** from rotary driller to drilling foreman, Odessa; **M. J. Deuth,** geologist, from Tallahassee to Jackson; **M. H. Guess,** production foreman, from Hobbs to TXL; **M. L. Kerlin,** senior geologist, from Jackson to Houston; **D. S. Malkin,** stratigrapher, from Baltimore to Tallahassee; **D. C. Meyers,** junior mechanical engineer, from Kilgore to Midland; **J. L. Milsted,** drilling foreman, from Black Bayou to Weeks Island; **W. S. Pike,** senior geologist, from Baltimore to Tallahassee; **C. J. Scheffler,** mechanical engineer, from Midland to McCamey; **C. R. Schriber,** drilling foreman, from West Lake Verret to Black Bayou; **W. A. Scott,** junior exploitation engineer, from Donaldsville to Lake Charles; and **C. H. Taylor,** from mechanical engineer to division engineer, production, Kilgore.

Theodore N. Law, grandson of the founder of Barnsdall Oil Co., has been elected to the company's board of directors to succeed **Edward M. Skeehan.** Law is connected with Falcon-Seaboard Drilling Co. Skeehan, who has resigned as a director and as treasurer of the company because of ill health, will remain a vice president. **Ben L. Young** was elected treasurer to succeed Skeehan and **Walter J. Philp** was named comptroller to succeed Young.

D. Shailer S. Philbrick, U. S. Engineers, has been elected president of the Pittsburgh Geological Society. **John T. Galey,** independent operator, was named vice president; **David K. Kirk,** Gulf Research & Development Co., secretary, and **Charles H. Feldmiller,** Equitable Gas Co., treasurer.

Hugh A. Neal, assistant manager of the Perco division of the chemical-products department of Phillips Petroleum Co., has been awarded the Silver Star for gallantry in action. Neal, as a lieutenant colonel, commanded the 463rd Parachute Field Artillery Battalion and was given the award for heroic action at Artena, Italy, in 1944.

Cliff W. Peery, assistant drilling and production superintendent in Eastern Venezuela for Mene Grande Oil Co., C.A. (Gulf Oil Corp.), has recently completed a business trip to the United States and returned to Eastern Venezuela.

O. C. Wheeler, vice president in charge of exploration, International Petroleum Co., Ltd., recently inspected Tropical Oil Co.'s field operations in Colombia. Tropical is an International Petroleum subsidiary.

Aden E. Stiles, senior engineer in the economics department of Carter Oil Co., Tulsa, has been transferred to Oklahoma City as senior geologist. Other recent Carter transfers include: **William L. Irby,** seismograph party chief, Colombia, South America, to Texarkana, Ark.; **Taylor E. Little,** clerk, St. Elmo, Ill., to Mattoon, Ill., as regional personnel manager; **Henry J. Louy,** field repairman, Rodessa, La., to Carmi, Ill.; **Gerald E. Zeigler,** junior geophysicist, seismograph party, Craig, Colo., to Rolling Fork, Miss., as seismograph assistant.

Paul Montgomery, executive assistant to Louisiana Conservation Commissioner Joseph L. McHugh, has announced he is resigning to join the firm of Bates & Cornell, consulting petroleum geologists and engineers, Lafayette, La.

J. M. de Vengoechea, assistant to the manager of Cia. de Petroleo Shell de Colombia, is on a combined business and vacation trip to New York and London. He plans to spend several months on the continent.

Dr. Scott W. Walker, process research supervisor with the research department of Stanolind Oil & Gas Co., Tulsa, recently received the War Department's certificate of appreciation for his work during the war as civilian chief of the chemical-engineering division of the Chemical Warfare Service's development laboratory at Massachusetts Institute of Technology. Dr. Walker, who joined Stanolind in April 1946, formerly was an assistant professor of chemical engineering at M.I.T., serving on loan with the chemical warfare laboratory during the war. The group with which he was associated worked on the manufacture of toxic agents and later on flame throwers.

Edgar Waite, public-relations director for Standard Oil Co. of California, has resigned to do consulting work in the public-relations field. Appointment of his successor has not been announced.

James B. Dodson, chief gager at London, Tex., for Warren Petroleum Corp., has been named to receive the President's Medal from the National Safety Council. Dodson is December saved the life of his wife through application of artificial respiration.

David N. Newby, engineer, production department, Phillips Petroleum Co., has been transferred from Bartlesville to West Edmond, Okla. **Gene Clark,** also an engineer in Phillips production department, has been assigned to the Burbank (Okla.), district from Guymon, Okla.

W. G. Mutersbaugh, present party chief of Survey Party 4 of Shell Oil Co., Inc., recently was presented a bronze plaque in recognition of the party's record of 10 years without a disabling injury on the job. The presentation was made at a dinner in Dallas by **R. L. Trott,** Shell land-department manager. The party was supervised by **H. L. Ohlinger** from April 1937 to August 1944 and since that time by Mutersbaugh. Present members of the party are **P. P. Guizerix, A. N. Southworth, F. L. Donnier, J. J. Sinitiere, R. A. Thomas,** and **D. D. Knight,** whose names along with those of the supervisors were inscribed on the plaque.

L. H. Major has been named manager of the pipe-line division and **G. W. Wallace** has been promoted to

L. H. MAJOR

G. W. WALLACE

superintendent in charge of the Freedom, Pa., refinery in two major changes announced by Freedom-Valvolene Oil Co. Major, superintendent of the refinery for the past 10 years, succeeds J. J. Dunlevy, who died recently. Wallace was promoted from his post as chief chemist, a position he had held for more than 10 years.

Francis E. Powell, Jr., has been appointed chairman of the foreign-trade committee of Socony-Vacuum Oil Co., Inc. **F. H. Henry** has been named vice chairman, and **Arthur G. Reed** and **O. J. Bellis,** members. In other changes, **L. A. Blumenthal** and **M. J. A. Bertin** have been appointed assistants to the general manager of foreign trade; **C. V. Barry** will become European representative of the committee's planning staff, with head-

Members of the advertising staff of The Oil and Gas Journal and Petroleo Interamericano from offices throughout the United States held their annual meeting last week in Tulsa. Following 3 days of conferences, the group flew to Shreveport for a tour of fields and installations in Louisiana and the East Texas area. They were accompanied by C. O. Willson, editor of the Journal, and Kenneth B. Barnes, engineering editor. Above, prior to boarding the plane, are: J. Howard Tinkham, Los Angeles; E. S. Klappenbach, Chicago; Charles A. Wardley, Pittsburgh; John M. Spears, Tulsa; John D. Reilly, Tulsa; Alfred M. Jones, New York; Barnes; Mitchell Tucker, New York; Willson; C. R. Farmer, Chicago; Miss Wilma Hadorn, airline hostess; and Wayne Rives, Tulsa, advertising manager of the two publications

PERSONALS

Speaker's table at a luncheon during the first regional meeting of the Society of Exploration Geophysicists held under auspices of the first local chapter to be organized, the Geophysical Society of Tulsa. (See story, page 287.) In the picture are: L. L. Nettleton, S.E.G., vice president; A. B. Bryan, first vice president, Tulsa chapter; Henry Cortes, past president, S.E.G.; G. H. Westby, Seismograph Service Corp.; Dr. Arthur A. Brant, Toronto, Ont., University; T. A. Manhart, chairman, entertainment committee, Tulsa chapter; Cecil H. Green, president, S.E.G.; R. Clare Coffin, president, Tulsa chapter; J. J. Jakosky, past president, S.E.G.; Colin Campbell, business manager, S.E.G.; Francis F. Campbell, secretary-treasurer, Tulsa chapter; and H. M. Thralls, second vice president, Tulsa chapter

quarters in London; **Charles F. Darlington** has been appointed American representative; and **C. T. Crawford** will be manager of supply operations.

J. R. Warford has been named special United States representative in charge of a newly created wax section of Sun Oil Co.'s industrial-products department. Until recently, Warford was managing director of British Sun Oil Co., Ltd., London; Netherlands Sun Oil Co., Rotterdam, and its subsidiary Belgium Sun Oil Co., Antwerp. **George W. Mock,** technical representative for wax products, will be associated with Warford.

G. Marsh has been appointed senior engineering assistant, maintenance, of the Toledo refinery of Standard Oil Co. (Ohio). Other recent personnel changes at the refinery include: **W. H. Joslin,** to safety engineer; **G. E. Conrad,** fire marshal; **R. J. Schell,** foreman of the labor department; **S. E. Johnston,** foreman of the utilities department; **C. O. Hostetter,** refinery foreman (shift); **A. Bourgeois,** foreman, combination unit-delayed coker; and **Johnny Voorhees,** formerly process engineer at the Latonia refinery, Covington, Ky., foreman of the gas plant.

Angus P. McEachern has been appointed chairman of the California management committee of Kern Oil Co., Ltd., to succeed **Roscoe W. Stephens.** McEachern is California counsel and assistant secretary of the company. **R. Joe Stephens,** general superintendent, has been appointed a member of the committee.

Lewis H. Boyd has accepted a position as manager of the gravity-meter division of Western Geophysical Co., Tulsa. He formerly was with Brown Geophysical Co. in Houston.

James Warke, for several years field superintendent for Brown, Moyer & Brown in Turner Valley, has left Calgary for the Persian Gulf, where he will be employed by Bahrein Petroleum Co., Ltd.

Ralph W. Boyd has been appointed assistant comptroller of Stanolind Oil Purchasing Co., Tulsa. **D. A. East** has been named chief accountant, and **T. E. Martin** assistant chief accountant.

J. F. Amelunxen, New Castle, Del., is scheduled to leave the United States June 1 for Caracas, Venezuela, where he will become assistant to the resident engineer for Venezuelan Atlantic Refining Co.

Shifts

S. S. Gifford, superintendent, Rocky Mountain Drilling Co., Montebello to Bakersfield, Calif.; **Wayne Ewing,** superintendent, Rocky Mountain Drilling Co., Riverdale to Bell, Calif.; **Philip G. Young,** engineer, Union Oil Co. of California, Long Beach to Wilmington, Calif.; **Grady Van Hooser,** superintendent, American Oil Service, Long Beach to Compton, Calif.; **Roy M. Huffington,** geologist, Humble Oil & Refining Co., Roswell to Santa Rosa, N. M.

G. K. Chappell, superintendent, Phillips Petroleum Co., Sanford to Phillips, Tex.; **R. F. Robbins,** superintendent, Falco Oil Well Service Co., Beeville to Alice, Tex.; **E. B. Woodell,** superintendent, Humble Oil & Refining Co., Beaumont to Monroe City, Tex.; **R. W. Blackburn,** engineer, Continental Oil Co., Conroe to Kilgore, Tex.; **H. W. Volk, Jr.,** geologist, Tide Water Associated Oil Co., Houston to Corpus Christi; **Hezakiah Keaton,** foreman, Magnolia Petroleum Co., Olden, Tex., to Lovington, N. M.

John F. Hunt, engineer, Shell Oil Co., Inc., Pampa to Wichita Falls, Tex.; **Richard A. Aukerman,** engineer, Shell Oil Co., Inc., Oklahoma City to Wichita Falls, Tex.; **Quentin Quick,** chemist, Magnolia Petroleum Co., Oakdale, La., to Artesia, N. M.; **L. D. Jones,** superintendent, Bateman Drilling Co., Opelousas to Sorrento, La.; **Clyde S. Long,** superintendent, Loffland Brothers Co., Vero Beach, Fla., to LeHigh, Okla.; **William H. Roe,** engineer, Superior Oil Co., Grayville to Crossville, Ill.

J. B. Monk, superintendent, Mississippi Asphalt Co., Sandersville to Laurel, Miss.; **Hugo A. Koester,** engineer, Standard Oil Co. (Ind.), Highland to Whiting, Ind.; **R. L. Kretz,** geologist, The California Co., Denver to Casper, Wyo.; **G. A. Schofield,** geologist, The Texas Company, Duchesne to Vernal, Utah; **W. R. Reed,** superintendent, Sinclair Refining Co., Tulsa to Independence, Kans.; **William E. Harrelson,** superintendent, Rocky Mountain Drilling Co., Rock Springs, Wyo., to Lyman, Okla.; **A. W. Black,** foreman, Continental Oil Co., Davis, Okla., to Casper, Wyo.; **Neal Clayton,** geologist, Republic Exploration Co., Oklahoma City to Wewoka, Okla.

DEATHS

William E. Matchett, 76, one of the original incorporators of Magnolia Petroleum Co., died May 20 at his home in Dallas.

H. J. L. Toombs, 61, associated with Magnolia Petroleum Co., died May 21 in Dallas. Toombs, who joined the Magnolia organization in 1911, went to Dallas in 1934 as district manager. He retired February 1 but remained in an advisory capacity to the marketing division.

Richard Blaine Kester, 54, retired district superintendent at Caripito, Venezuela, for Creole Petroleum Corp., died May 19 at his home in San Angelo, Tex. A native of West Virginia, Kester began his oil career in 1917 as a tool dresser with Carter Oil Co. After service in Mexico he was transferred to Caripito in 1934, remaining in Venezuela until May 1945.

Lucher Crocker Snider, 64, professor of geology at the University of Texas, died May 24 in Austin. He was chief geologist of Empire Gas & Fuel Co from 1917 to 1919 and in 1940 was president of the American Association of Petroleum Geologists.

GULF COAST *Section*

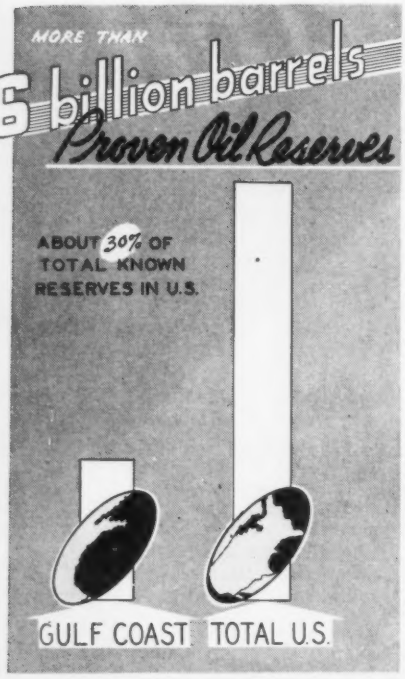
FEATURING—

Economic analyses of one of world's most important oil areas . . .
Technical and operating articles on all phases of operations . . .
Summary of refining and petrochemical expansion programs now under way . . .
Insert map showing location of fields, refineries, and salt domes . . .
List of fields, their daily and cumulative production and other data . . .

THE GULF COAST— PETROLEUM CENTER

by Richard J. Gonzalez

Here one of the industry's leading economists summarizes the position of the Gulf Coast in relation to national and international petroleum activities



THE Gulf Coast area of the United States, consisting of a zone about 150 miles wide along the coast from Brownsville, Tex., to Florida, is still the dominant center of petroleum activity in the world today, although its claim to this position may be challenged before many years by the Middle East. Operations in the Gulf Coast affect many foreign markets as well as the entire area east of the Rocky Mountains. A few facts about the area indicate the economic situation it occupies in the petroleum industry.

1. Proved oil reserves in the area exceed 6 billion barrels, about 30 per cent of the total known reserves in the United States.

2. Gas reserves of about 60 trillion cubic feet represent more than one-third of the total for the United States, and are equivalent in heat value to 10 million barrels of oil.

With a proven oil reserve of more than 6 billion barrels, and a daily production of 1.4 million barrels from 25,000 wells, the Gulf Coast occupies a dominant spot in the nation's economic structure

3. The area produces about 1,275,000 bbl. per day of crude oil and condensate from more than 25,000 wells.

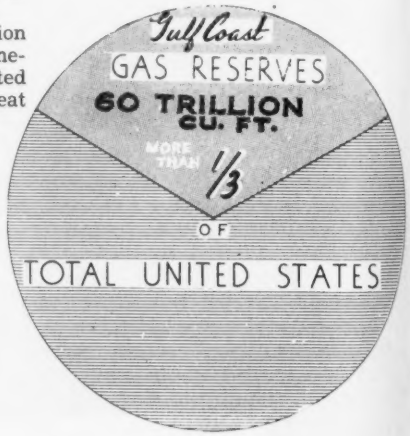
4. Gas processing plants produce 82,000 bbl. per day of natural gasoline and condensates, about 25 per cent of the U. S. production.

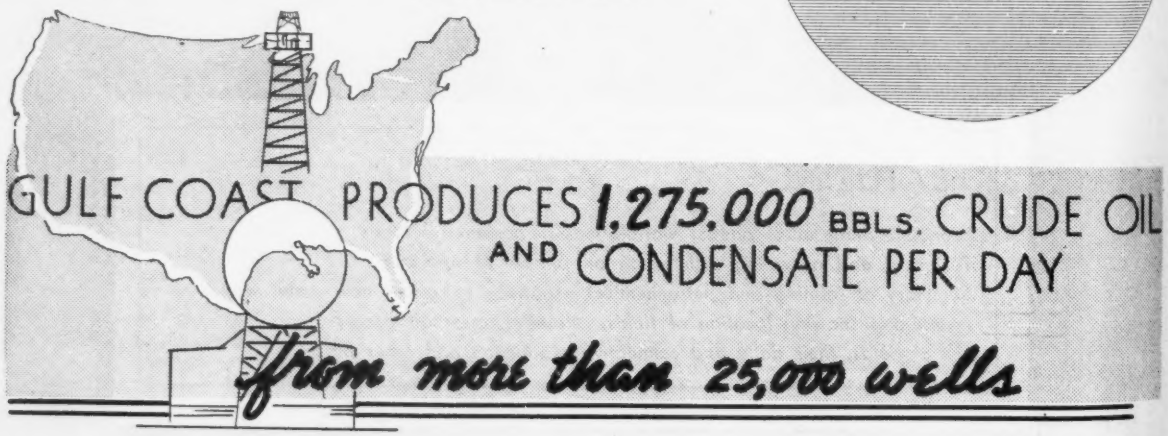
5. Refinery crude runs to stills in the area of about 1,500,000 bbl. per day account for over 30 per cent of U. S. operations.

6. Shipments of crude oil and products from the Gulf Coast to the East Coast and foreign markets are currently about 1,675,000 bbl. per day, including crude oil received from interior areas.

Oil Production

The Gulf Coast area is one of the great oil-producing centers of the





world. Some of the largest producing fields in the United States are located in the Texas Gulf Coast, including Anahuac, Conroe, Hastings, Old Ocean, Seeligson, Thompson, Tomoconnor, and Webster. It was not until the thirties that these major fields were discovered and developed, although the area has been under rather continuous and fairly intensive exploration ever since 1901 when the famous Spindletop field was discovered.

The Gulf Coast area is characterized by fairly deep and prolific production. Many wells in the area are more than 10,000 ft. deep, and deepest producing well has recently been completed in Louisiana at about 14,000 ft. The average production of the 25,000 wells in the Gulf Coast is about 50 bbl. per day, compared with a national average of approximately 11 bbl. per day.

Within recent years some production has been discovered in Florida and in South Mississippi, but the large production on the Gulf Coast continues to be in Texas and Louisiana. The Texas Gulf Coast from Brownsville to the Sabine River produces about 885,000 bbl. per day. The Louisiana Gulf Coast area produces about 315,000 bbl. per day of crude oil. South Mississippi and Florida currently are producing about 40,000 and 1,000 bbl. per day, respectively. In addition, about 28,000 bbl. per day of condensate are produced from wells in the Gulf Coast from Texas to Mississippi.

At current production rates and present prices of about $1.75 a barrel, the annual income from the petroleum liquids produced in the Gulf Coast area is about $870,000,000. Much of this income is distributed in the area in the form of payrolls, taxes, royalty payments to landowners, and purchases of supplies and services. Even the net income realized on production is largely reinvested in new leases and wells in the constant search for oil.

Gas Production

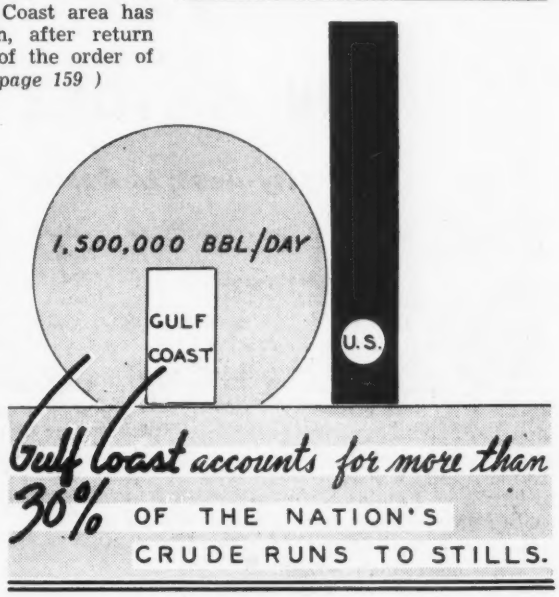
The gas reserves of the Gulf Coast area are about 60 trillion cubic feet, or substantially greater than the reserves of the famous Panhandle-Hugoton fields. The reserves are widely scattered in many fields, among which the largest and best known are Agua Dulce, Stratton, La Gloria, Katy, Old Ocean, Pledger, Sheridan, Erath, and Gwinville. A number of the interstate pipe lines secure their gas supplies from the Gulf Coast area.

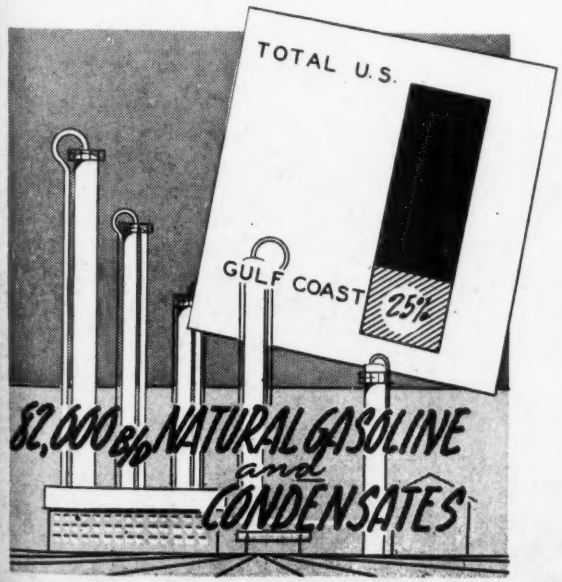
Accurate statistics on total production are difficult to secure because of inadequate reports on production of casing-head gas, but it is estimated that the Gulf Coast area has a net gas production, after return of gas to reservoirs, of the order of

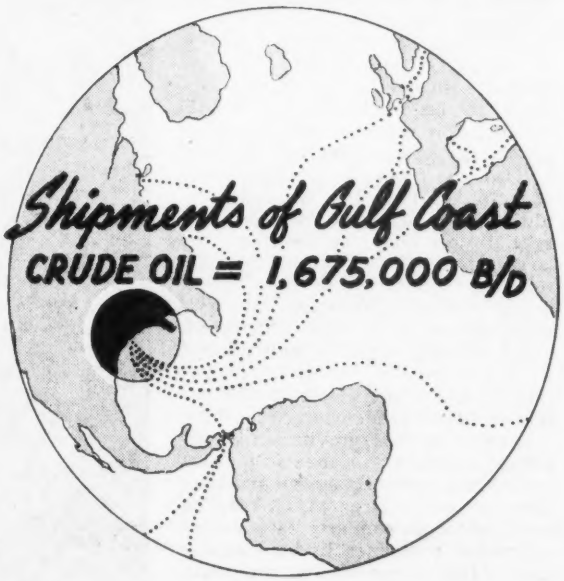
(Continued on page 159)

The author of this article has been economist for Humble Oil & Refining Co. since 1937. His experience prior to that time was largely as faculty member of University of Texas, East Texas State Teachers College, and University of New Mexico. He also served for a short while as project manager for the Resettlement Administration. He holds B.A., M.A., and Ph.D. degrees from University of Texas, the last being obtained in 1934. He has authored numerous papers before the Texas Statistical Council, American Association of Petroleum Geologists, Interstate Oil Compact Commission, and American Institute of Mining and Metallurgical Engineers. He is currently chairman of the I.O.O.C. economics advisory committee.

The Gulf Coast produces about a quarter of the nation's natural gasoline and condensates, accounts for over 30 per cent of its crude runs to stills, and ships 1,675,000 bbl. of crude and products daily to eastern and foreign markets







GULF COAST

Refiners in Greatest Building Program IN HISTORY

by Arch L. Foster

KEEPING pace with the newest developments in refining, filling in its weak spots in refining processes, and whipping its facilities into shape to meet the strongest Gulf Coast refining industry is launching into the greatest building program in its history. Long the greatest refining center in the world, and expanding by leaps and bounds during World War II, Gulf Coast refiners are increasing their appropriations and building the units they will need to meet requirements of tomorrow's customers.

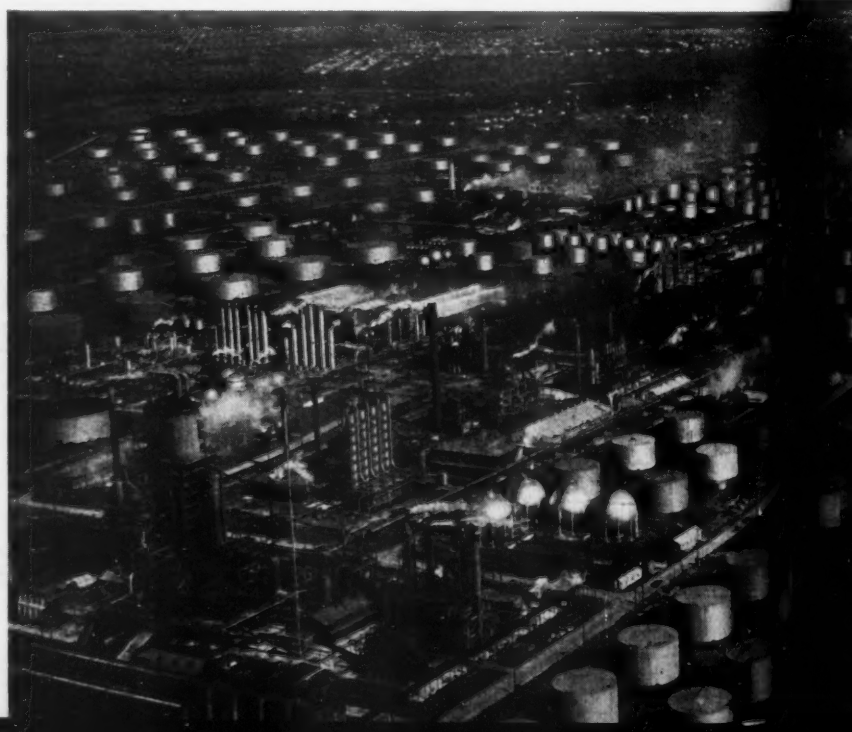
With more than 400,000 bbl. per day of catalytic cracking already in operation, an additional capacity approaching 100,000 bbl. per day is in construction or on drawing boards of designing departments. Yet the greatest single effort of refiners appears to be installation of crude-fractionation capacity, and processes for charge preparation for different units in the plant. It is in this phase of refining, plus the expansion in ultramodern units for lubricant and special-fuels manufacture that the largest activities are found. Boosting refining flexibility and thus taking a leaf from the chemical industry's book, seems to be the watchword. Total refining capacity has jumped from the prewar rating of 25 per cent of the nation's total to 30 per cent over-all crude-charge capacity.

Reasons for the gravitation of refining operations to the Gulf Coast are mainly three: Extensive available areas on which large plants may be installed, with similarly large areas on which personnel living quarters can be built economically; proximity to vast crude-producing areas in both Texas and Louisiana, fields too numerous to mention here but shown in detail elsewhere in this issue, along with large production inland within easy pipe-line distance of the coast; and easy and cheap water transportation to the world at large, including especially the crowded eastern seaboard population centers, the cities and consuming areas in the wide-flung Mississippi River basin, occupying half the area of the United States. The multitudinous indentations of the Texas Coast and tributaries make a "natural" in the transportation field of voluminous petroleum products to the greatest consuming country of them all. Many of the harbors are shallow, and must be dredged periodically to maintain depths adequate for large ocean-going tankers, a small investment compared to rail haul or even for building artificial harbors. Several canals, such as the Houston Ship Channel, the Intracoastal Canal, and the Sabine-Orange-Beaumont ship channel facilitate the easy handling of the huge quantities of petroleum products refined in this great area daily.

Manufacturing Advantages

A fourth strong inducement for establishment of industrial facilities on the coastal plain is that of lower living costs, a lower scale of prices for commodities and for labor, resulting in lower manufacturing costs over-all. This advantage is diminishing rapidly, under the attack of organized militant labor.

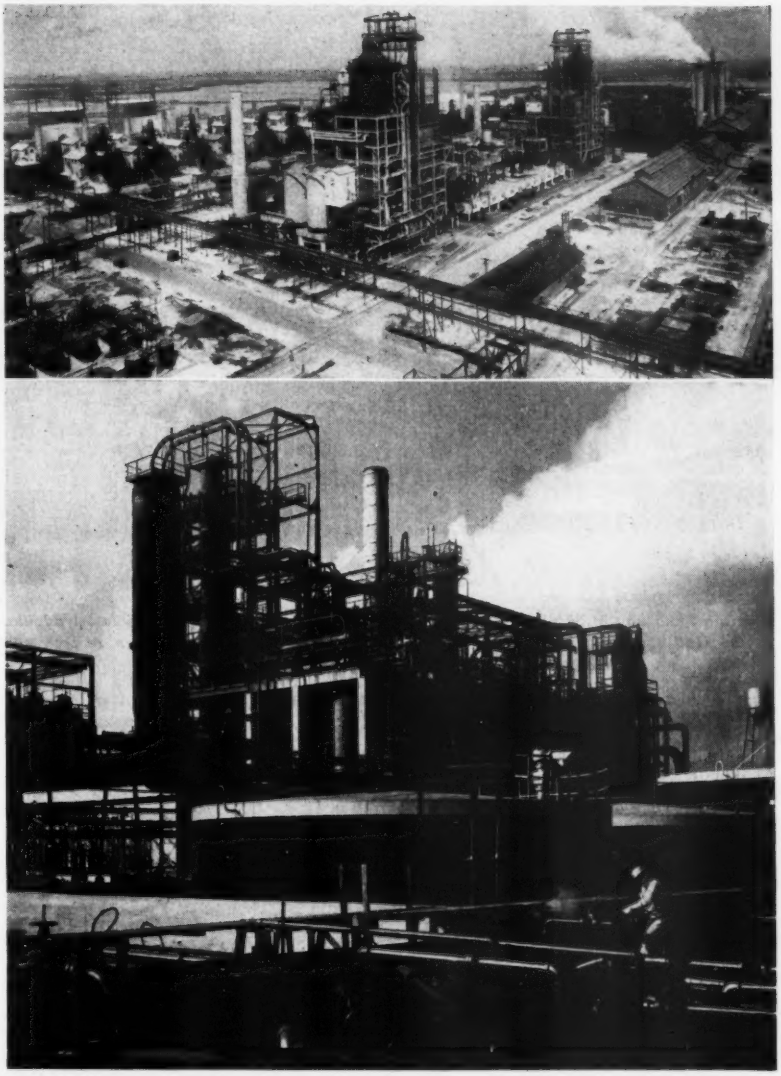
In the same trend and of like caliber is the concentration of capacity on the Gulf Coast for both petroleum chemicals and synthetic rubber and its intermediates. Reference to tabulated data in another article in this issue shows that 210,000 long tons of G.R.-S.-rubber capacity is already established on the coast which, with 30,000 long tons of butyl-rubber capacity constitutes more than a third of our U. S. capacity. The G.R.-S. rubber alone is 30 per cent of our over-all capacity for that tire-rubber type; the butyl capacity is 44 per cent of the U. S. capacity for that product, so important for



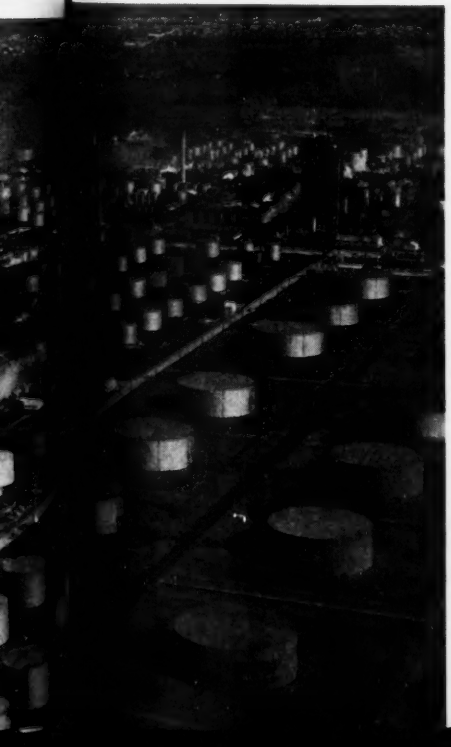
inner tubes and specialty products. Fifty-two per cent of the nation's styrene is made on the Gulf Coast, at the Dow and Monsanto plants—the latter destroyed by fire recently, but to be rebuilt—101,000 tons of it; styrene makes up one-fourth of the hydrocarbon content of G.R.-S. rubber, approximately. Thirty per cent of our national butadiene production is producible on the Gulf Coast, or 192,500,000 long tons annually. The largest butadiene plant in the world, 100,000 long tons, is at Port Neches.

Corresponding to the huge refining capacity already installed on this coast is the colossal building program which is being undertaken to bring refining operations into the forefront as to output as well as product qualities. A huge percentage of the capacity for aviation gasoline is located on the coast, in the refineries of Standard Oil Co. of New Jersey in its Louisiana division at Baton Rouge; Humble Oil & Refining Co. at Baytown, a Houston suburb; Pan American Refining Corp., Republic Oil Refining Co., and others at Texas City; Gulf Refining Co., Atlantic Refining Co., The Texas Co., Pure Oil Co., and Magnolia Petroleum Co., in the Port Arthur-Port Neches-Beaumont area; Shell Oil Co., Inc., Sinclair Refining Co., Crown Central Petroleum Corp., Eastern States Petroleum Co., Inc., plants in the vicinities of Houston and Corpus Christi.

Referring to Table 2, which comprises the latest information on new and recent building developments as this is written, the program is a very varied one, and probably includes a total expenditure, from 1946 to 1949, of a third of a billion dollars; several building programs are still tentative.



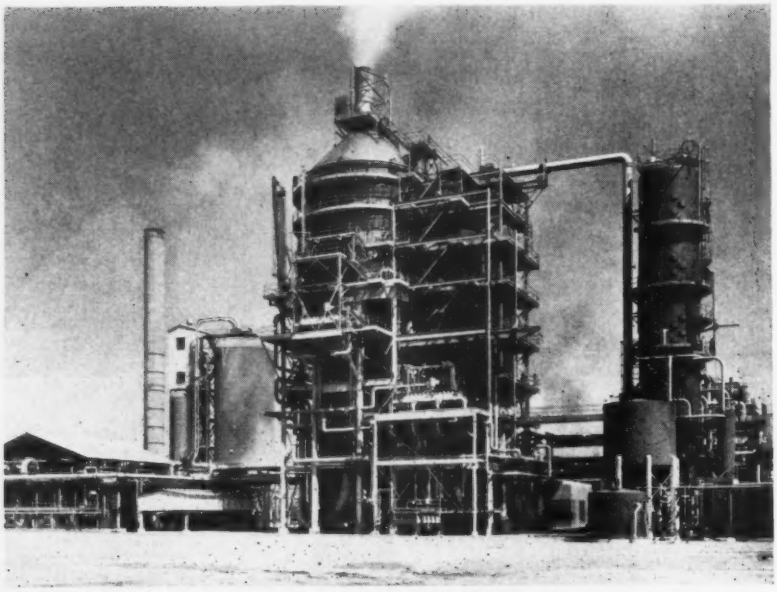
Top: These two huge Fluid catalytic cracking units in The Texas Co.'s Port Arthur, Tex., refinery are typical of the advanced state of refining technology on the Gulf Coast; a large portion of our catalytic cracking capacity is found in the large number of units of different processes, Fluid, Houdry and T.C.C., in these largest refineries. Above: Combination distillation and cracking units are typified by this interconnected crude topping and Polyform cracking unit, operating at Gulf Refining Co.'s Port Arthur plant



Left: Aerial view of the central portion of Humble Oil & Refining Co.'s Baytown refinery shows thermal and catalytic cracking, fractionation and feed preparation, alkylation, and several other process units

These plans include at least two large catalytic cracking units not mentioned specifically, as well as one completed recently by Shell and one being converted by Pure from wartime "treating" operations to direct catalytic cracking routine. At least one polyform unit is under direct plan, the purpose being to add to the refiner's flexibility the peculiar properties of polyform gasoline in the production of tomorrow's improved motor fuels; a desulfurization unit is going in to improve octane rating and TEL susceptibility of fuels made probably from relatively high-sulfur inland crudes. Four or five large crude-distillation units are planned or building, mostly of 30,000-bbl.-per-day crude capacity. These units are complicated and flexible, being built expressly for providing charge stocks for various processes, to handle crudes to yield the most valuable products most in demand at any given time.

One complete lubricating-oil plant has been announced by Shell for Deer Park, near Houston; progress on that plant has been delayed due to strikes but it is planned for completion late this year. This plant may



This big Fluid unit at Shell Oil Co., Inc., Deer Park (Houston) refinery is the latest addition to the Gulf Coast's big catalytic cracking family; Shell has always been a prominent manufacturer of aviation fuels as well as motor fuels

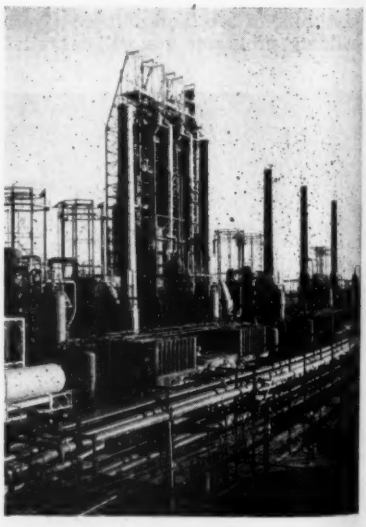
TABLE 1—ACTIVE GULF COAST REFINERIES, JANUARY 1, 1947

	Crude cap., bbl. per day	Cracking capacity	
		Catalytic	Thermal
Louisiana—			
Chalmette Petroleum Corp., Chalmette	10,000		6,000
Cities Service Refining Corp., Lake Charles	70,000	51,000	8,750
Continental Oil Co., Lake Charles	9,500		5,600
Evangeline Refining Co., Jennings	1,000		
Pan American Petroleum Corp., Destrehan	7,500		
Petco Corp., Marrerro	3,500		2,000
Shell Oil Co., Inc., Norco	35,000		21,300
Standard Oil Co. of N. J., Baton Rouge	180,000	51,000	48,500
Total capacity, bbl. per day	316,500	102,000	92,150
Texas—			
American Mineral Spirits Co., Corpus Christi	10,000		
Atlantic Refining Co., Port Arthur	27,000	15,000	15,000
Clymore Co., Inc., Pettus	1,300		
Coastal Refineries, Inc., Port Isabel	7,000		2,500
Crown Central Petroleum Corp., Houston	20,000	10,000SD	8,500
Danaho Ref. Co., Pettus	2,000		500
Eastern States Petroleum Co., Houston	30,000	5,000	12,500
Eddy Refining Co., Houston	2,000		
Great Southern Corp., Corpus Christi			4,000
Gulf Oil Corp., Port Arthur	192,000	30,000	68,000
Hamman Oil & Refining Co., Bay City	2,300		
Humble Oil & Refining Co., Baytown	190,000	53,100	89,100
Humber Oil & Refining Co., San Antonio	7,000		
Magnolia Petroleum Co., Beaumont	125,000	58,000	42,200
Maritime Oil Co., Houston	5,000		
McBride Refining Co., La Blanca	2,000		
Nueces Refining Co., Clarkwood	2,500		
Pan American Refining Corp., Texas City	100,000	23,000	37,000
Pontiac Refining Corp., Corpus Christi	20,000		
Prichard Refining Co., San Antonio	1,500		
Pure Oil Co., Nederland	55,000	10,000	88,000
Rado Refining Co., McAllen	1,000		
Refugio Refinery, Refugio	1,500		
Republic Oil Refining Co., Texas City	28,000	12,000	10,000
Shell Oil Co., Inc., Houston	85,000	25,000	40,000
Sid Richardson Refining Co., Texas City	18,500		2,000
Sinclair Refining Co., Houston	73,000	20,000	42,000
Sinclair Refining Co., Corpus Christi	27,000	10,000	10,000
Southwestern Oil & Refining Co., Corpus Christi	18,000		
Stone Oil Co., Texas City	7,500		
The Texas Co., Houston	27,500		
The Texas Co., Port Arthur	135,000	59,000	107,500
The Texas Co., Port Neches	40,000		
The Texas Co., San Antonio	7,000		6,000
Three Rivers Refinery, Three Rivers	1,500		
United Gas Pipe Line Co., Beeville	600		
Total	1,272,700	330,100	584,800
Grand total, Gulf Coast refining capacity, bbl. per day	1,589,200	432,100	676,950
Total cracking capacity, bbl. per day		1,109,050	
Percentage, total U. S. refining capacity (active)	29.4	32.7	

be considered typical of present-day good practice; it covers 75 acres, will handle 30,000 bbl. of raw stocks per day, and will include five separate units: vacuum distillation, deasphalting, solvent extraction, solvent dewaxing, and chemical treating. It can refine oils of high, medium, and low-viscosity indices and is planned to operate mainly on southwest crude fractions. Typical of current practice, the new plant includes several pilot plants, indispensable to the refiner in directing the operation and improving the efficiency of his commercial units. Construction is in the hands of Lummus Co. and of M. W Kellogg Co., and is expected to require 1,250 carloads of supplies and materials. When the exact amounts of materials needed on the coast for the refining, natural-gasoline, and petroleum-chemical building programs is not known and cannot be determined at present, it obviously runs to staggering quantities.

Humble is planning an M.E.K.—methylethylketone — solvent dewaxing unit to handle 4,000 bbl. of raw charge per day; Sinclair plans a new barrel house and grease plant at Houston, along with a 30,000-bbl.-per-day crude-distillation unit there, to operate chiefly on West Texas crudes. When it is considered that a major portion of the wartime building of refining units took place on the Gulf Coast the impact of the new building programs on the industry's position is tremendous.

Interesting also are the data compiled recently, which show that of the 1,109,050 bbl. of daily cracking capacity, 432,100 bbl. is of the cata-



The skyscraper dimensions of some of the catalytic units, such as Gulf's Port Arthur Thermofor unit shown here, give some idea of the tremendous amounts of aviation-fuel materials produced by them during World War II. They are used now to make either aviation or motor-fuel components

lytic variety which includes Houdry, Fluid, and T.C.C. units; practically 677,000 bbl. per day is thermal cracking, indicating quite definitely the trend in cracking processing on the coast. Including new and projected catalytic cracking capacity, some tabulated here and more not yet announced — one company alone plans two new Fluid units, one of which will be on the coast, which is not included in the tabulation—this capacity will soon pass the half-million mark. The only approaches to additions to thermal cracking capacity known to be in process now are polyform units, which cannot be considered orthodox, noncatalytic cracking. Other important units building are for fractionation of crude and other fractions to segregate highly desirable fractions, in motor fuels and naphthas, diesel fuels, and especially lubricating fractions. Segregation, too, of special cuts for various purposes, such as charge stocks for catalytic cracking, high-priced naphthas and chemical intermediates from the thermal and catalytic cracking units, olefinic and isoparaffinic fractions for alkylation, butadiene and styrene production is receiving more attention, as evidenced by additional fractionation equipment being installed in different plants.

In Table 3 are shown the trends in refining outputs and operations on the coast, postwar variety. While producing only about 20 per cent of the nation's crude, these plants run 30-32 per cent of the total crude runs, the difference coming from inland Texas, Louisiana, the Mid-Continent, and from foreign sources, such as Venezuela and Colombia. Gulf Coast refineries produce about 30 per cent of our total motor-fuel supply, and very remarkably, more than half the nation's entire kerosene output comes from these plants, a fact traceable no doubt to the large inland areas where kerosene is used for illuminating purposes, as well as to export business for the same consumption. Making 37-40 per cent of our total distillate-fuel-oil production, much of which goes to thickly populated eastern United States via ocean transport, these refineries produce only 25 per cent or less of our heavy fuel (bunker) oil.

TABLE 2—REFINERY BUILDING, NEW, PROJECTED, AND COMPLETED RECENTLY, GULF COAST

Company name and location—	Crude refining capacity, bbl. per day	Building
Louisiana—		
Chalmette Petroleum Corp., Chalmette	10,000	
Cities Service Refining Corp., Lake Charles	70,000	Only nominal change and maintenance going on.
Continental Oil Co., Lake Charles	9,500	No new building planned or under way; studying lube-plant idea.
Pan American Petroleum Corp., Destrehan	7,500	Program not completed. (April 15, 1947.)
Shell Oil Co., Inc., Norco	35,000	
Standard Oil Co. of N. J., Baton Rouge	180,000	
Texas—		
Atlantic Refining Co., Port Arthur	27,000	New waterway loading docks.
Crown Central Petroleum Corp., Houston	20,000	No new building; running at full capacity.
Eastern States Petroleum Co., Houston	30,000	
Gulf Oil Corp., Port Arthur	192,000	Three—20,000-bbl.-per-day Badger topping units, two for West Texas crude, one for East Texas crude; adding 12,000 bbl. per day (doubling) polyform capacity; desulfurization unit.
Humble Oil & Refining Co., Baytown	190,000	One—M.E.K. solvent dewaxing (lube) unit, 4,000 bbl. per day.
Magnolia Petroleum Co., Beaumont	125,000	New garage building and equipment; modernization of machine and plate shops, other divisions of maintenance-department facilities; steam locomotives replacing diesels; new warehouse. Cost, approx. $12,000,000.
Pan American Refining Corp., Texas City	100,000	Only minor revamping and improvement going on, as usual; no large additions planned so far.
Pure Oil Co., Nederland	55,000	Converting T.C.C. treater to catalytic cracking unit; new docks; new pump house; new machine shop.
Republic Oil Ref. Co., Texas City	28,000	No new building; negotiating for WAA alkylation unit, etc.; undecided as yet.
Shell Oil Co., Houston	85,000	Fluid catalytic cracker, completed fall, 1946. 20,000 bbl. per day, cost approx. $35,000,000; lube plant, 30,000 bbl. per day, finish November 1947, cost approx. $10,000,000; production research laboratory, 135 employes, finish August 1947, cost approx. $3,000,000.
Sid Richardson Refining Co., Texas City	18,500	Shut down temporarily, revamping heaters, etc. No new complete units.
Sinclair Refining Co., Houston	73,000	New barrel house and grease plant; crude-distillation unit for West Texas crudes—30,000 bbl. per day; finish sometime in 1948.
Sinclair Refining Co., Corpus Christi	27,000	
Southwestern Oil & Refining Co., Corpus Christi	18,000	
The Texas Co., Houston	27,500	
The Texas Co., Port Arthur	135,000	
The Texas Co., Port Neches	40,000	
The Texas Co., San Antonio	7,000	

TABLE 3—PETROLEUM STATISTICS, TWO MONTHS, 1947—GULF COAST*

	Thousands bbl.											Thousands bbl.	
	Crude prod.	Crude runs to stills	Motor fuel gasoline	Kersene	Distillate fuel oils	Residual fuel oils	Lubricating oils	Wax, 1,000s lb.	Coke, tons	Asphalt, tons	Still gas, M.c.f.	Road oil	Misc.
Jan. 1947—So. La.	28,747	10,762	4,783	1,457	1,916	1,469	222	28	78	178	504	....	506
Tex. Gulf Coast		34,681	14,566	3,229	6,157	6,925	1,236	49	138	131	1,943	2	613
Feb. 1947—So. La.	27,295	9,817	4,060	1,230	1,909	1,398	236	40	77	206	473	....	438
Tex. Gulf Coast		31,331	13,129	3,129	5,172	6,398	1,052	42	104	188	1,800	15	484
Total Gulf Coast (2 mos.)	56,042	86,591	36,538	9,045	15,154	16,190	2,746	159	402	703	4,720	17	2,041
Total U.S. (2 mos.)	279,493	281,850	122,918	18,658	45,877	70,838	8,129	591	1,906	5,901	13,113	481	4,379
Per cent on Gulf Coast	20.1	30.7	29.7	48.5	33.0	22.9	33.8	26.9	21.1	11.9	36.0	3.5	46.5

*Bureau of Mines figures.

Some Factors Affecting Success of South Texas Workovers

by H. N. Lyle*

AS new oil fields become more difficult to find and more expensive to develop due to their greater average depth, South Texas operators are giving closer attention to the problem of increasing the ultimate recovery from wells already drilled and fields already discovered.

From a workover standpoint, increasing the ultimate recovery from a well is limited at most to three broad possibilities: (1) the reservoir from which it is now producing; (2) reservoirs penetrated by the well and cased off; and (3) deeper reservoirs within the practicable limits of deepening operations through an oil string of casing. Each of these possibilities is discussed separately as follows:

While some of the economic factors affecting workover and repair operations will be discussed separately later in this article, economics and operations are so interrelated that it is advisable to mention now that the study of any well or field for the purpose of initiating a workover campaign should include as much consideration of things not to do as of things to do. On workovers, the expenditures are rapid, the results uncertain, and the returns, if any, slow.

Well and field-production histories are essential in planning workovers. Operators are keeping better records on gas and water production from wells. In some instances, by the use of a recording water meter installed on the main salt-water drain line of the tank battery and a recording orifice meter installed on the separator-gas vent line, accuracies approximating that of the oil measurements in the stock tanks are obtained. It is much easier and more accurate to estimate the water and gas produced by the individual wells in a battery when there is an accurate total to check against than it is to try to use well-head water shakeouts and spot gas reading or even short-duration well tests. If accurate data prevent one ill-advised workover attempt, the cost of collecting the data is repaid manifold.

Oil, gas, and water-production data, together with periodic reservoir-pressure measurements, form the basis for material-balance calculations and reservoir-performance analyses. These studies, in turn, often indicate desirable corrective measures that otherwise would not be apparent. For instance, an individual well in a reservoir may be producing a substantial volume of oil each day, but with attendant excessive gas or water production. While the performance of this well, considered by itself, may be satisfactory and profitable, the harm it is causing to the reservoir by its excessive voidage may be so great as to make profitable the repair, recompletion elsewhere, or even closing in of the well.

Too, reservoir studies may lead to early recognition of the dominant recovery mechanism of the reservoir, with consequent saving of expensive and futile workovers. For example, some South Texas reservoirs have continued to flow naturally until all the recoverable oil was obtained and the well fluid became 100 per cent water. Early attempts to shut off water in this type of reservoir would not only be unsuccessful but undesirable. Again, if increasing gas-oil ratios are due to gas coming out of solution within the reservoir in a

*District engineer, Seaboard Oil Co. of Delaware.

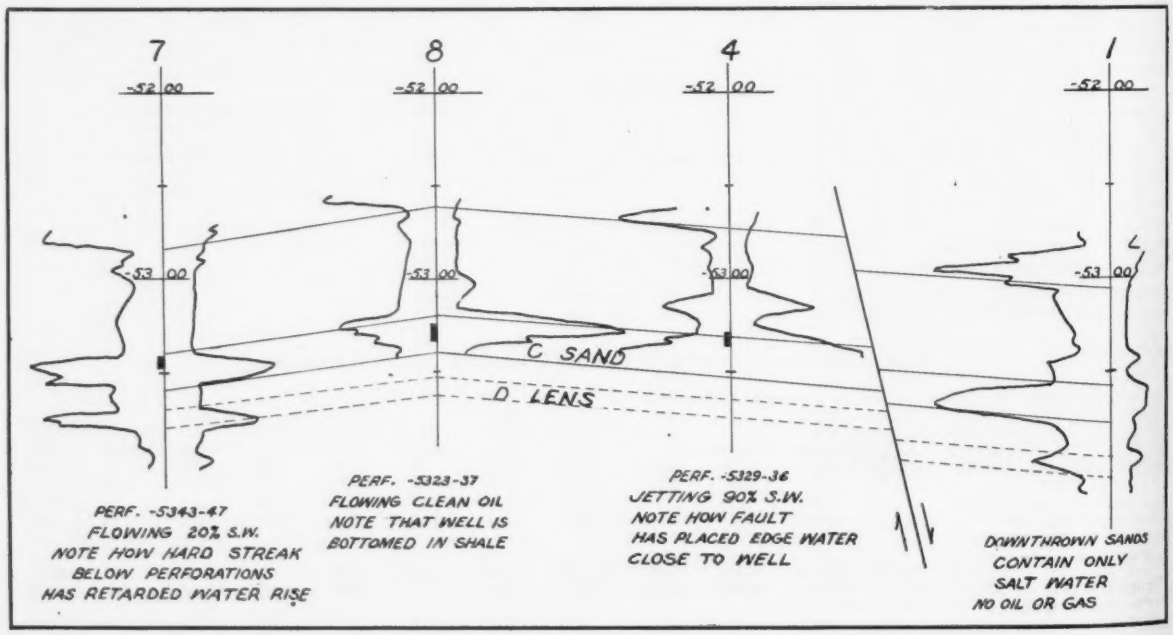


Fig. 1—Effect of geological conditions on practicability of workovers

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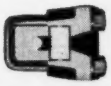

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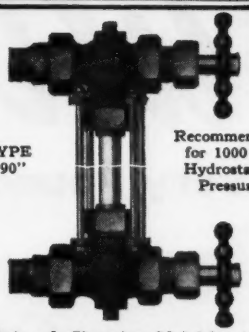

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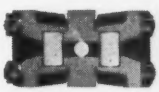

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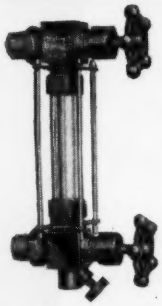

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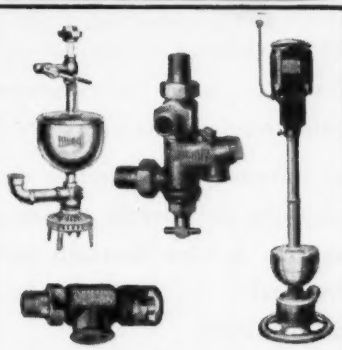

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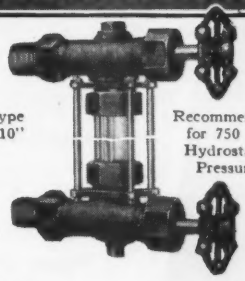

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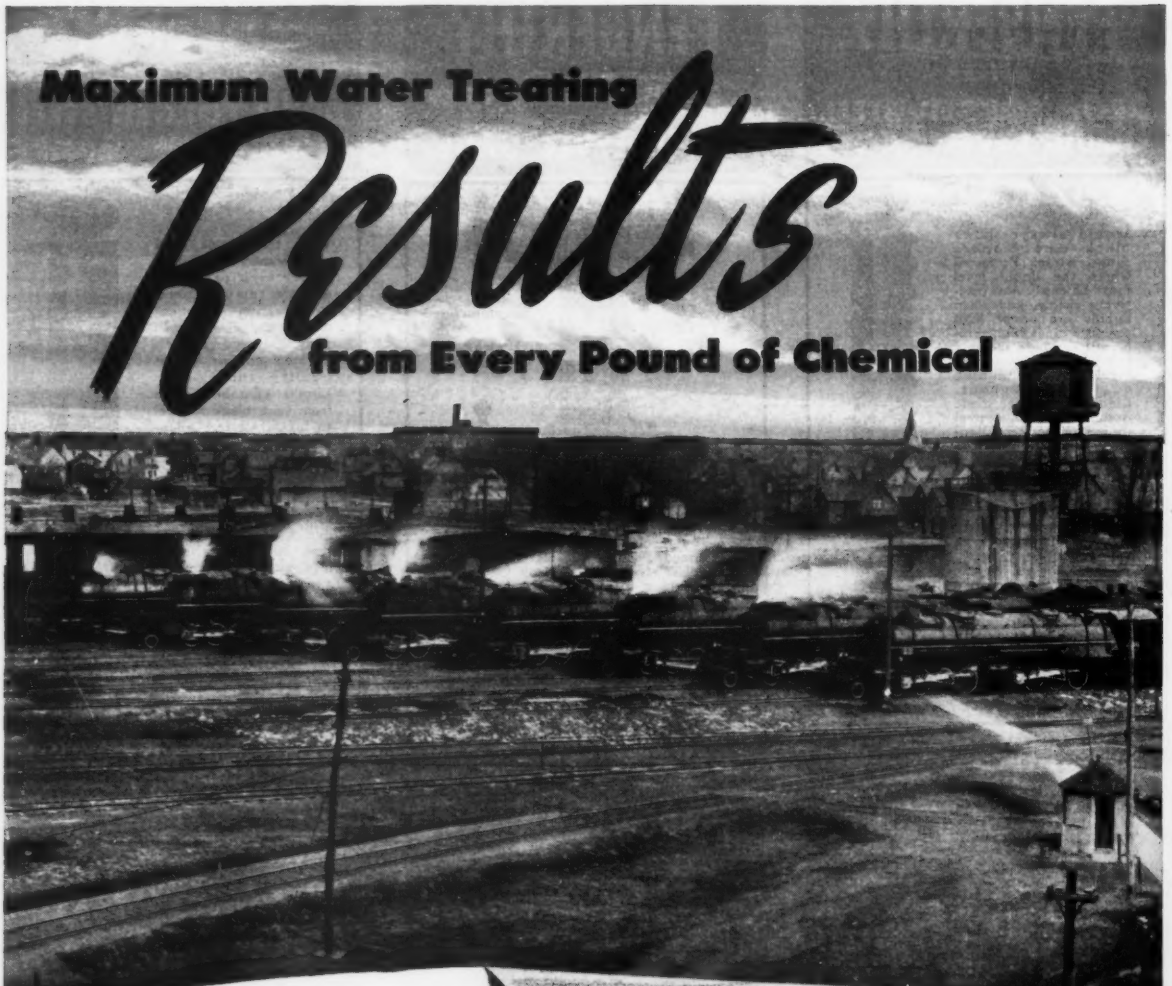

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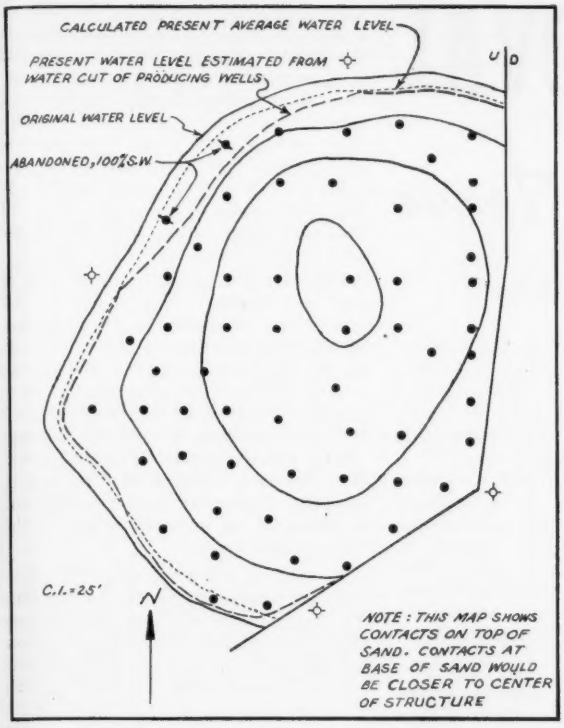
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NOTE: THIS MAP SHOWS CONTACTS ON TOP OF SAND. CONTACTS AT BASE OF SAND WOULD BE CLOSER TO CENTER OF STRUCTURE

Fig. 2—Showing influence of dip on water encroachment

dissolved-gas type of reservoir, no amount of squeezing, either with cement or plastic, will result in lower ratios.

Ample and accurate geological records are equally as important as production records. Cores should be described in sufficient detail to enable a stranger, many years in the future, to get an accurate picture of the formation by reading the description. Electric logs, especially when used in conjunction with core descriptions, drill-stem tests, and production data are most useful in planning workovers. Accurate contour maps of the top of all producing sands should be prepared and referred to constantly. Sand-thickness maps, as well as being necessary for the preparation of an estimate of reserves, will often throw a great deal of light on why a well behaves as it does and whether a workover is feasible.

Electric-log cross-sections are of particular value in showing the relationship of gas and water levels to the producing interval, in showing lensing and lateral and vertical changes in permeability, and explaining seeming incongruities within the reservoir. Fig. 1, a cross section of a portion of flank of a typical South Texas Frio Sand reservoir, shows, in Well No. 4, the effect of a small fault in hastening water encroachment into a well, which, judged from its subsea producing interval, should be producing clean oil. Obviously, attempts to shut off this water would be a waste of money. Well No. 7 shows how a shale lens in the bottom of the well has prevented effective rise of the water level in this well. Wells Nos. 4 and 8, drilled prior to well No. 7 and well No. 1, did not penetrate the sand lens some 30 ft. below the producing sand. The cross-section indicates that well No. 4 and well No. 8 can be deepened to it and production obtained providing a water shut-off behind the liner can be effected. Fig. 2, a map of the sand top of the same reservoir, shows how changes in rate of dip influences the changes in the oil-water contact. For equal withdrawal rates, wells on the steeply dipping portion to the northwest will become water logged by vertical water encroachment more rapidly than those on the flatter flank to the southwest, where the encroachment has a larger horizontal component. A workover of a well on the steeply dipping flank predicated upon the excellent characteristics of a well on the flatter flank is unsound.

Workovers Within Reservoir

In considering workovers within a reservoir, it is vital to know how much oil has been taken from that reservoir and what the probable future recovery will be. Here again, production and geological records, including cross sections for the identification of the various producing horizons, are necessary. While the problem of reservoir identification is not peculiar nor confined to South Texas, it is aggravated by the lenticular and generally thin nature of the sands and the intense faulting found on many of the structures. Sometimes the faulting is so widespread that water drives and gas-cap drives are precluded even if the sand is permeable and the water and gas cap present in their respective parts of the main structure. This condition leaves dissolved gas and gravity as the only recovery mechanisms available, and workovers in reservoirs of this type are usually characterized by lack of success.

One other type of record is important: the history of previous workovers within the field. Before deciding to spend money trying to repair a well, a thorough review of your own

(Continued on page 185)

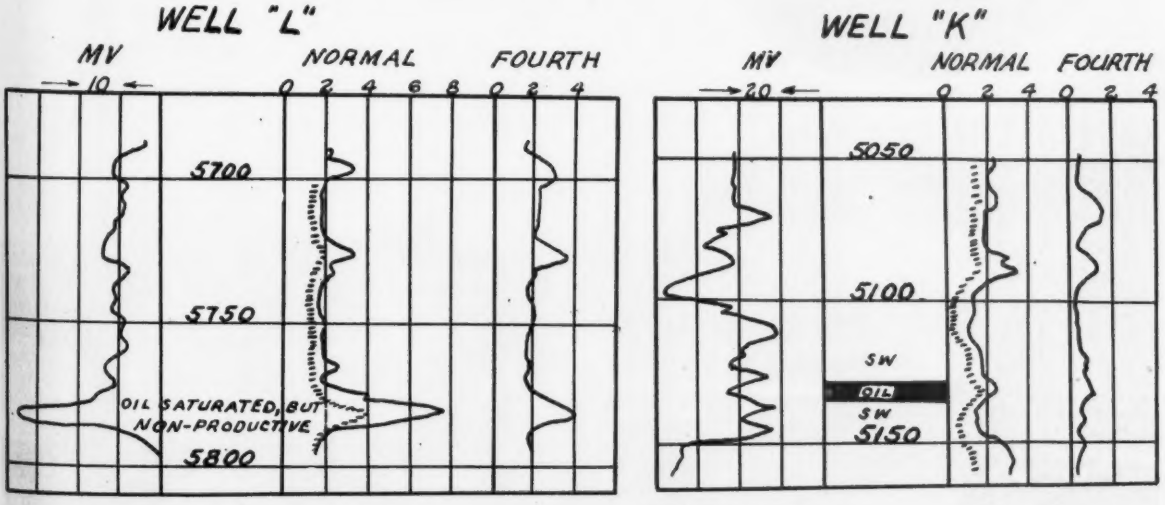


Fig. 3—Showing inconsistency of values on electric logs

PARAFFIN REMOVAL

In South Texas

by Emil F. Bowers and Heath Renfro

PARAFFIN accumulation is not a widespread problem in Southwest Texas. However, when present, it offers the same trouble and expense of handling as in areas where it is more prevalent. To date there has been no definite "cure all" or inexpensive method of handling the accumulation of paraffin. This article may add little or nothing new to the numerous material written and published on the subject in the past. It will show what is being done and present some cost figures on handling a serious paraffin condition.

Of primary concern is the composition of the paraffin or amorphous wax. Knowledge of the composition may aid in arriving at a means of treatment. Generally speaking, paraffin is composed of particles of wax mixed with gum resins, crude oil, and asphaltic material. Extraneous materials which may be included in the deposit will include minerals and foreign matter in the production system. Such material may include silt, sand, water, and various oxides, sulfates and carbonates of iron, barium, calcium, etc. Freshly precipitated paraffin will consist of approximately 50 per cent wax, 30 per cent oil, and the remainder gum resins and asphaltic material.

Depositional causes include loss of gas and lighter constituents of the crude, loss of temperature, and presence of foreign particles in the crude to provide nuclei around which the wax or paraffin can precipitate. Other causes include loss of pressure, transfer of heat from the crude through tubing and casing to the ground, and the alternate wetting and drying of the face of the pay or the tubing due to changes in working level of the fluid in the hole.

In various fields or areas the predominant cause will vary. At this time the writers are working with a paraffin problem which is caused almost entirely by the loss of temperature. This is evidenced by the fact that the paraffin accumulation is found in the tubing string within 600 ft. of the surface, is aggravated by cooling due to gas expansion in wells producing on gas lift, and is helped by increased water percentages. This particular paraffin begins to precipitate at temperatures below 90° F.

Wax deposits will vary in color, texture, and consistency, depending on age, constituents, and amount of oil which has been lost through drainage and evaporation. Type of treat-

Left: Automatic rabbit or go-devil with a lease gager releasing the go-devil

Below: Paraffin-scraping unit mounted in a pickup truck, with paraffin tools in the hole. Man on ground is spudding the knife

ment to be employed will depend in part on composition, hardness, and place of accumulation. One of the first questions raised in attacking a paraffin problem is how can the accumulation be prevented, retarded, or place of deposition be controlled? Paraffin accumulation may occur in the reservoir, on the sand face, in the tubing, flow lines, in the separator and gun barrel, or stock tanks. In flowing wells or wells being produced on artificial lift from high operating levels formation of wax on the sand face or in the reservoir normally is not to be expected. This article will not deal with paraffin which is forming in the reservoir.

The writers have been unable to prevent the formation of paraffin, but have been able, in some cases, to reduce and retard its formation. Paraffin accumulation in the tubing can be handled in several ways. Methods employed include circulating steam through a check valve located in the tubing string below the point of accumulation, lubricating in paraffin solvent, cutting with the conventional tools suspended on a wire line, and continuous automatic operation of a rabbit or go-devil.

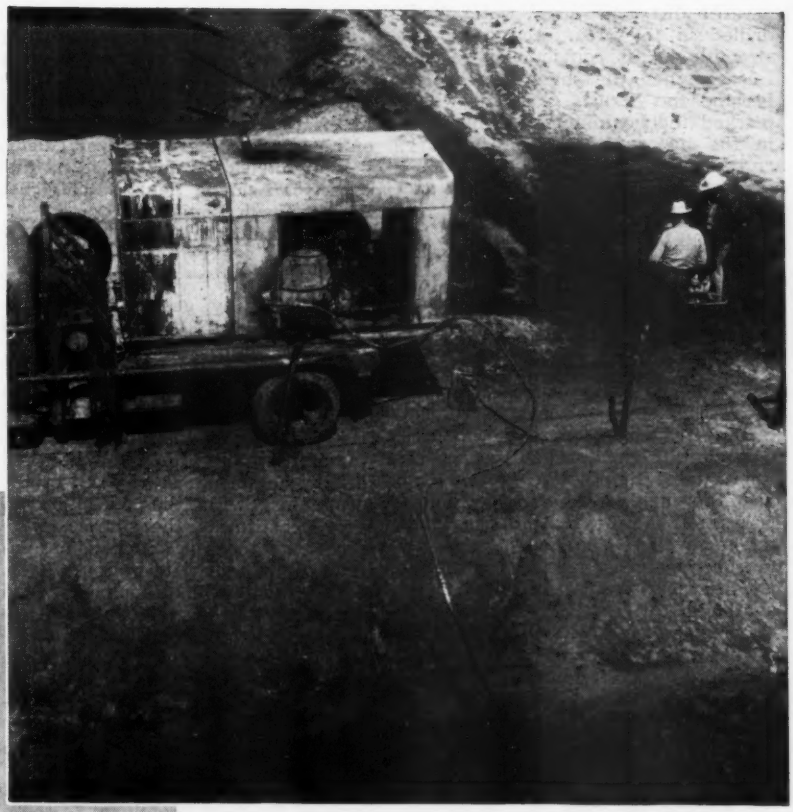
Use of Steaming Unit

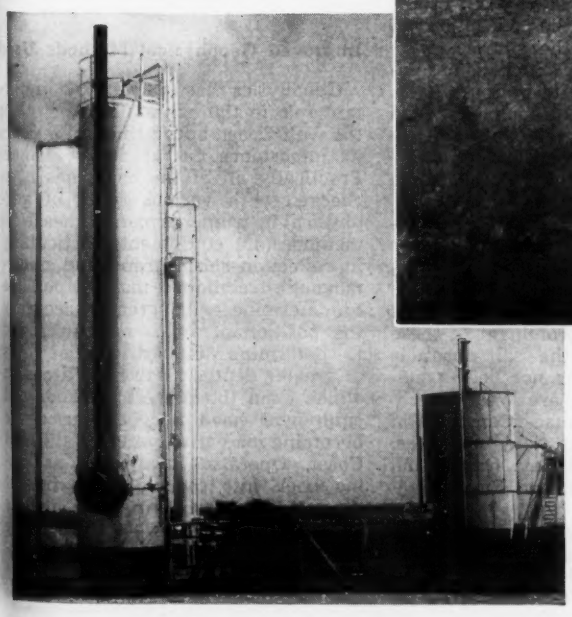
The most satisfactory method of removing the paraffin is by use of the steaming unit or paraffin knife; the least expensive method is the rabbit or go-devil, and the least satisfactory is the use of paraffin solvents. The steaming unit consists of a portable 40-hp. boiler mounted on a truck. The unit in use is a commercial type which retails for approximately $3,215. One smaller unit in operation about 20 months has required one major overhaul. Treatment of scale in the coils and an abundant supply of noncorrosive boiler water are the main problems. The unit is operated by a truck driver and one helper.

The check valve mentioned above may be a bellows type, pressure-operated valve, or a check valve salvaged from a discarded differential-type flow valve. The writers have cleaned several wells by forcing steam down the annular space between the tubing and casing and into the tubing through the check valve, and have found the method satisfactory. However, as the flowing pressure of the well must be exceeded by the steaming-unit pressure in order for the check valve to open, it has been found advisable to delay the cleaning of the wells in this manner until such time as the flowing pressure declines to such a point that the steaming unit may easily overcome the well-flowing pressure and at the same time deliver a sufficient quantity of steam to clean the tubing.

Until such time as the flowing pressure declines, the wells are cleaned with the conventional paraffin-cutting tools described presently. The paraffin-cutting tool is a hollow cylinder with a cutting edge on the bottom and of sufficient diameter to prevent hanging in 2-in. tubing. The

(Continued on page 163)





Above: Portable steaming unit in service

Left: View of a lease heater-treater

Emil F. Bowers is chief petroleum engineer for Southern Minerals Corp., Corpus Christi, Tex. A graduate, in 1937, of University of Kansas, he was associated with Republic Natural Gas Co. in Kansas and Texas until 1941, when he joined his present company as engineer. Except for 2 years' military service, he has been with the company since that time.

Coauthor Renfro is a graduate of University of Texas, also in 1937, and upon graduation joined the Texas Railroad Commission as petroleum engineer. Two years later he went to work for W. R. Davis, of Houston, as petroleum engineer and drilling superintendent. Following a period of service with Tide Water Associated Oil Co. and with the Navy, he joined Southern Minerals Corp. in January 1946.

TRENDS IN

Petroleum Geology

OF THE GULF COAST

by Michel T. Halbouty and Geo. C. Hardin, Jr.

THE finding of oil and gas fields in the Gulf Coast of Texas and Louisiana has progressed continuously since January 10, 1901, when oil was discovered at Spindletop, near Beaumont. Surface indications caused Capt. Anthony Lucas, an Austrian mining engineer, to believe that a structure which might be a trap for the accumulation of oil existed in this area. These surface indications consisted of a mound rising a few feet above the marshy land, gas seeps, paraffin dirt, and "sour" water wells drilled in the area. Acting on the strength of his convictions, Captain Lucas drilled the shallow well that became the "Lucas Gusher," which marked the beginning of a new era in the history of the oil industry, and firmly established the Gulf Coast of Texas and Louisiana as a new and important oil province.

During the 5 years following the discovery of Spindletop, surface indications and wildcat drilling led to the discovery of 29 domes in the Gulf Coast of Texas and Louisiana with 17 of these being productive of oil. From 1905 to 1924, however, the number of domes found decreased to such a low level that the cost of wildcat drilling in proportion to the chances of finding production had reached an unprofitable figure. The ground had been thoroughly combed by geological crews for surface indications which might reveal a shallow "dome"—all prospective areas had been drilled—and no more prospects seemed to be available. Due to this alarming situation, operating companies and their scientists had to turn to means other than surface geology in the Gulf Coast to locate oil-bearing structures. Very little subsurface geology was being worked—micropaleontology was just making its important entry as a contributor of definite information, and the electric log was yet to be invented.

Because of a lack of a definite means of locating structures, oil scientists turned to the study of geophysics, which is the application of the science of physics to geology, and in 1924 this new type of exploration made its debut. An exploration "boom" period followed the entry of geophysics into the Gulf Coast and into the oil industry. In the 9 years from 1924 until 1933, there were 74 domal structures found by geophysical instruments as compared to only 47 found in the preceding 23 years.

M. T. HALBOUTY

G. C. HARDIN, JR.

Michel T. Halbouty is an authority on the geological and engineering problems of the Gulf Coast of Texas and Louisiana. He was instrumental in the discovery of flank production on many salt domes and several fields in the Gulf Coast, and his latest discovery is Ashland field, Natchitoches Parish, North Louisiana.

Upon graduation from Texas A. & M. College in 1931, Halbouty immediately joined the old Yount-Lee Oil Co. in Beaumont as junior geologist and petroleum engineer and 2 years later was made chief geologist and petroleum engineer and served in that capacity until the firm was sold to Stanolind Oil & Gas Co. in August 1935. He then went to Houston and joined Glenn H. McCarthy and served as general manager and chief geologist and petroleum engineer for the company. He went into the consulting business for himself in May 1937. During the war he served as chief of the petroleum production section, planning division, in the Army-Navy Petroleum Board under the Joint Chiefs of Staff, where he was responsible for the study and recommendation for planning purposes of the world-wide crude-oil production, and the geological and engineering problems pertaining thereto.

George C. Hardin, Jr., joined the consulting firm headed by Michel T. Halbouty in February 1946. He studied geology and petroleum engineering at Texas A. & M. College and received a B.S. degree in 1941. After receiving his M.S. degree from the University of Wisconsin in 1942, he joined the United States Geological Survey and served as party chief in charge of the fluorspar work of the Geological Survey in Kentucky and Illinois. He left the U. S. G. S. in 1945 to become geologist and petroleum engineer with Carter-Gragg Oil Co.

The domes found by surface geology and wildcatting in the Gulf Coast prior to 1924 were shallow piercement-type domes where the salt mass was uplifted to within a few hundred feet of the surface so that all of the formations, with the exception of those constituting the surface, were pierced by the salt. Such domes include Spindletop, Hull, Sour Lake, and Barbers Hill. Geophysics, and subsurface geology, aided by micropaleontology and electric logs, however, located structures other than the shallow piercement-type domes, which in turn, resulted in the discovery of many deep-seated domal or anticlinal fields. Much of the present oil reserve of the Gulf Coast is situated on structures of this type. Some of the most prominent of these structures, where the salt mass is deep seated and has not been penetrated by the drill, are West Ranch, Friendswood, Anahuac, Conroe, Old Ocean, and Hastings fields of Texas, and LaFitte, Grand Bay, Quarantine Bay, Bateman Lake, and Bayou Sale fields of Louisiana.

In the past 10 years, faults have played an increasingly large part in the localization of the oil traps found. Most of the fault structures are relatively small but some have been very profitable. Geophysics and subsurface geology have been instrumental in locating many fault fields in the Gulf Coast. Daboval, Sterling, Mercy, and West Beaumont are type fields in which faulting has played a major part in localization of the hydrocarbons.

Improved Geophysical Methods Used

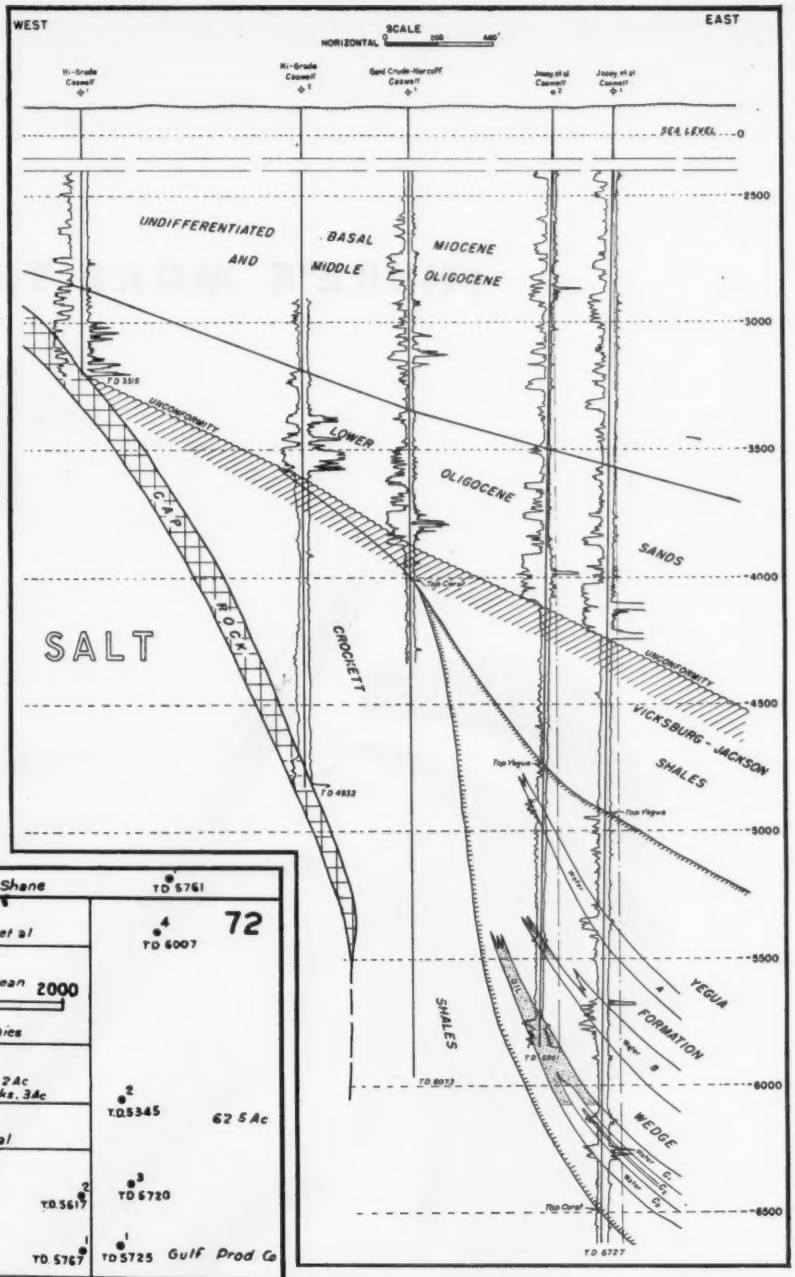
Geophysics has played an important role in the exploration for oil in the Gulf Coast, but in the past 8 years its importance has gradually waned. Practically all of the coast has been checked with various types of geophysical instruments many times. New methods and equipment, particularly in reflection seismograph and micromagnetic techniques, make it possible to determine with greater accuracy the position of small structures and to determine the attitude of beds at greater depths. However, areas on which even the newest methods and equipment have not been used are becoming increasingly rare in the Gulf Coast. Operating companies are going back into their old geophysical files and are restudying and drilling anomalies which were previously rated as Class C or D prospects. Many of these anomalies do not have closure but are considered to be possible

traps because of "wrinkles" in the geophysical contours.

Most Shallow Prospects Tested

During the war years, practically all of the shallow prospects, both geological and geophysical, were drilled. Special attention was given to the Frio trend where most of the fields occur at depth above 6,000 ft. An excellent example of this may be seen in southern Wharton and central Jackson counties where it is rare to find a distance of more than 2 miles separating wildcat wells drilled to test the Frio section. This means that any new fields remaining to be found along this shallow trend must necessarily be small in extent.

The one prolific source of relatively shallow production which remains in the Gulf Coast of Texas and Louisiana are the flanks of piercement-type salt domes where sand pinchouts and unconformities form traps for the accumulation of oil and gas. Several wells have been completed successfully on the flanks of such domes within the past 2 years. The trend among the Gulf Coast independents is toward these flanks—flank acreage on the old piercement-type salt domes has become important again as potential new oil fields. Unfortunately for the independent, most of the acreage on the flanks of piercement-type salt domes is owned in fee



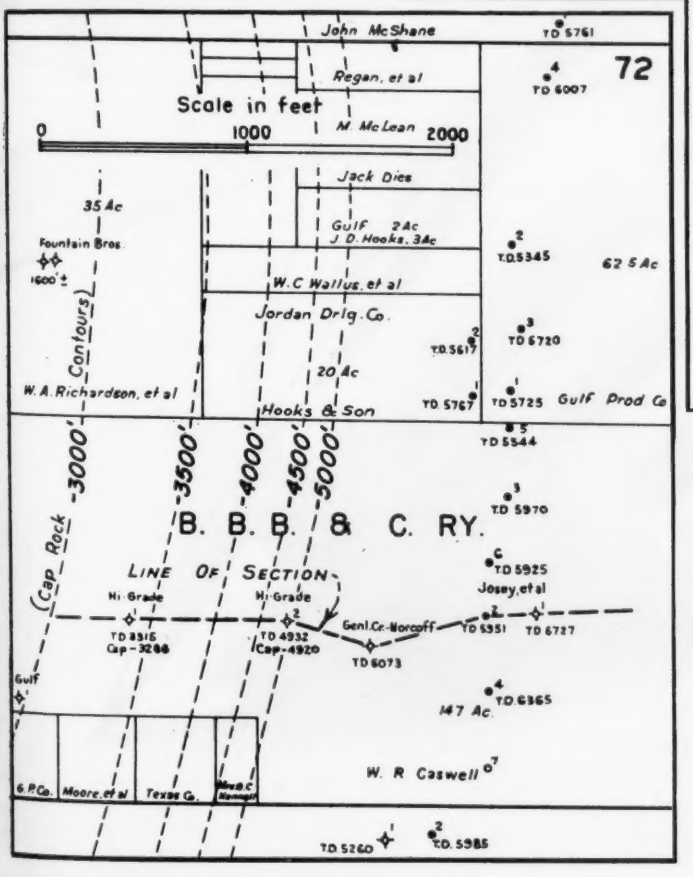


Fig. 1—Section through the east flank of the Saratoga dome, Hardin County, Texas, showing oil trap formed by pinchout of Yegua sands. Inset, left, is location map

by major oil companies. These major companies consider these fee lands as constituting potential oil reserves, and most of them are holding such lands as insurance against the future when it may become necessary to increase their proven oil reserves. The salt domes in the Gulf Coast still remain as the most prolific producers of oil in this region.

An excellent example of relatively shallow flank production is the east flank of the Saratoga dome, Hardin County, Texas. This flank production was discovered early in 1946; produc-

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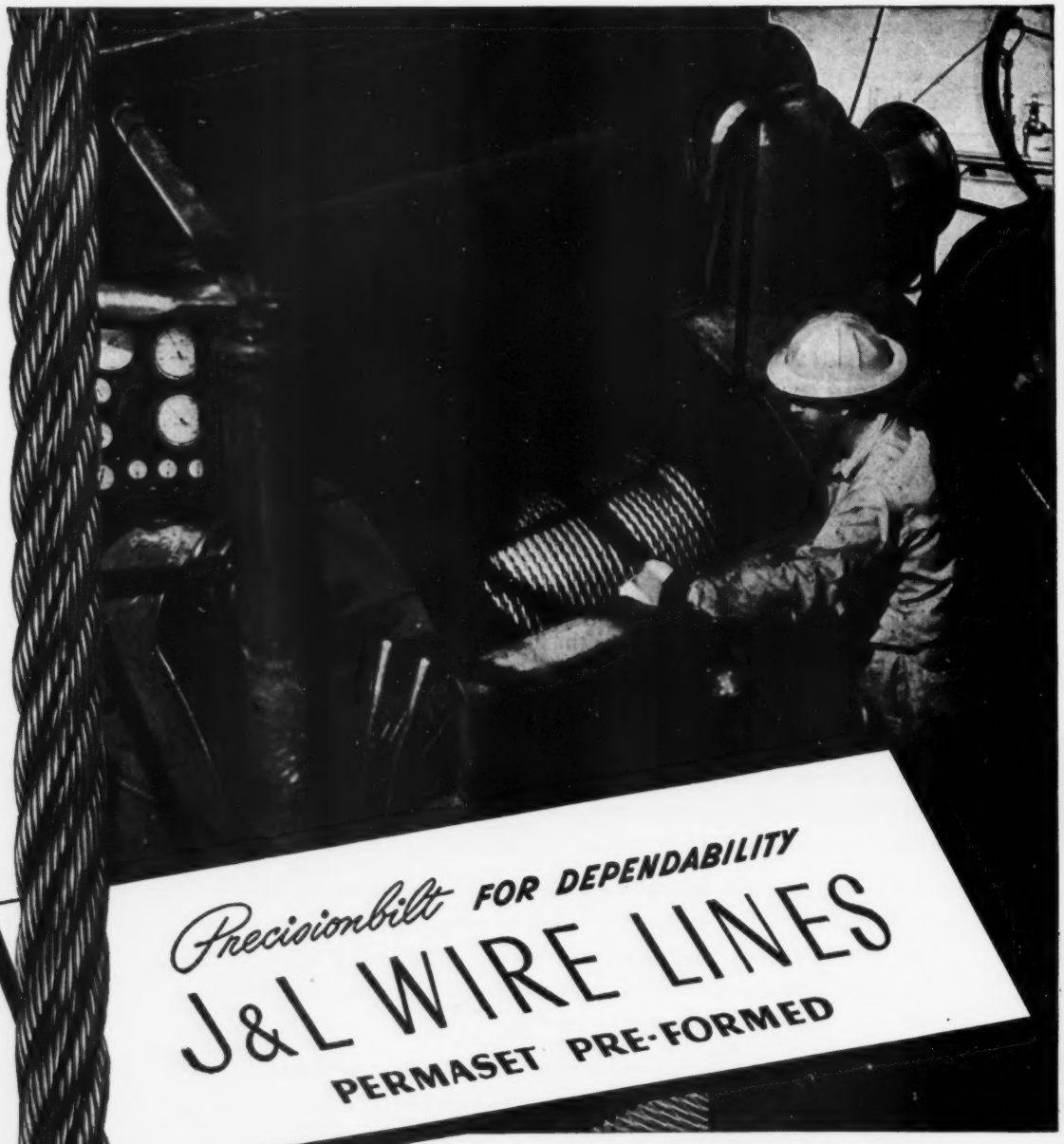

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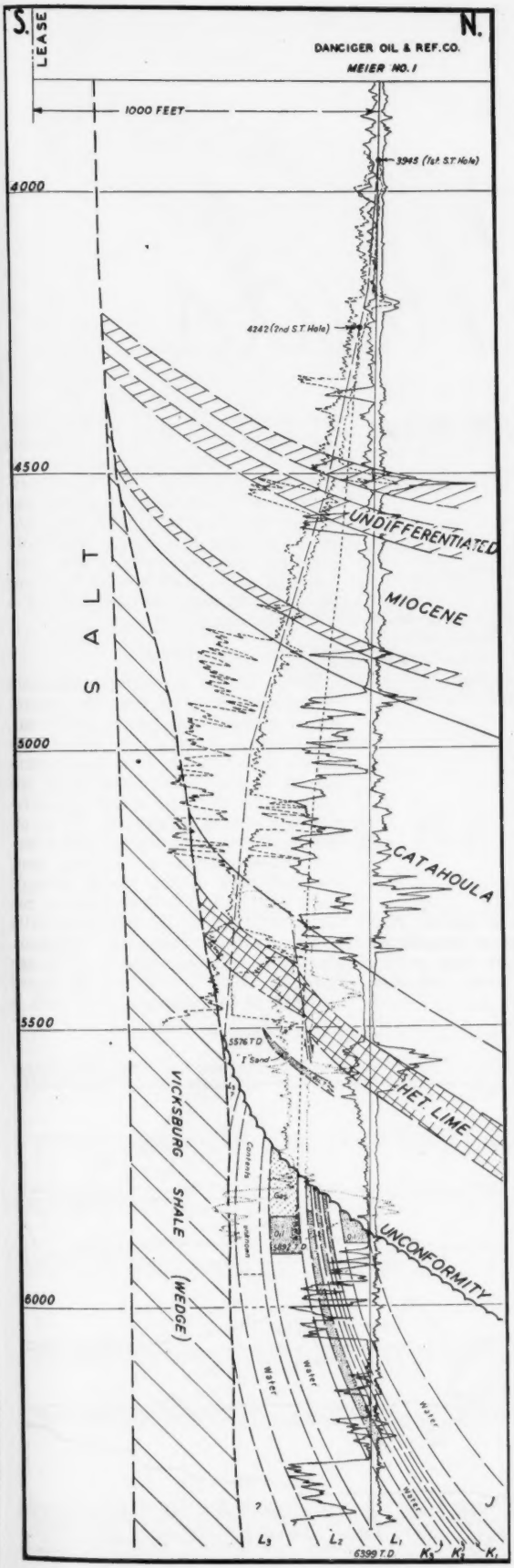


Fig. 2—(Left) Section through the north flank of the Nash dome, Fort Bend County, Texas, showing oil trap formed by local unconformity

Fig. 3—(Below) Section through the north flank of the Weeks Island dome, Iberia Parish, Louisiana, showing the zones from which comes the world's deepest production

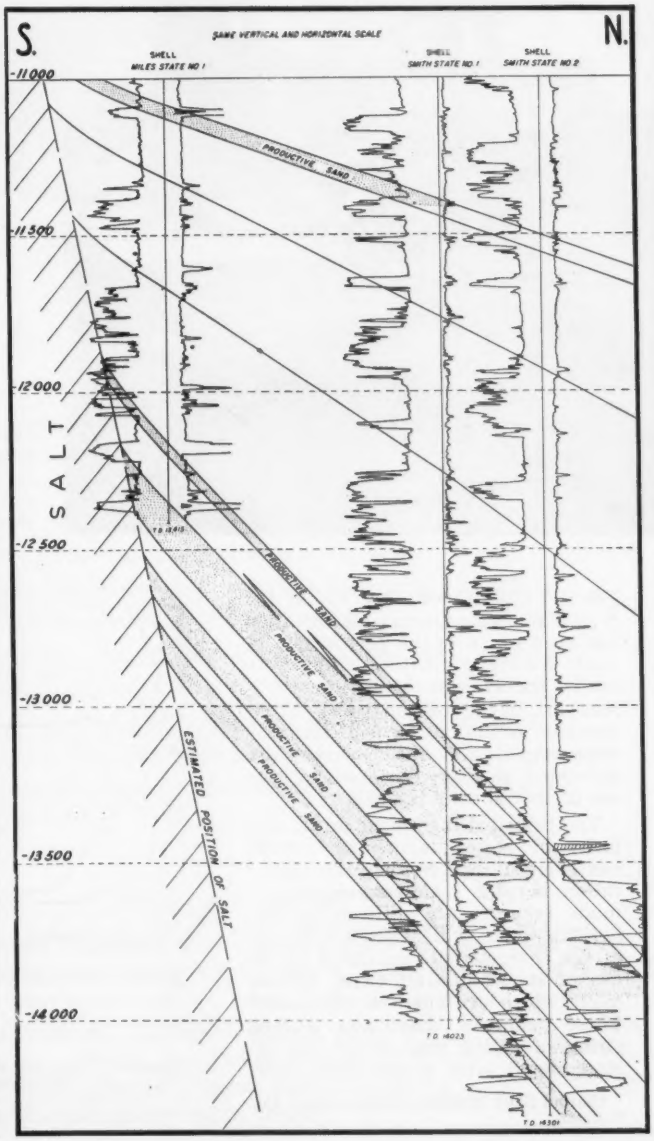
tion is from a stratigraphic trap formed by a pinchout of the Yegua formation. This relationship is shown in Fig. 1.

Another type of trap associated with the flanks of piercement-type salt domes is illustrated by the flank production on the Nash dome, Fort Bend County, Texas, discovered in 1945. Production here is from Frio sands that have been truncated by erosion, probably submarine, and sealed by the deposition of shales over the truncated edges. The section, Fig. 2, illustrates this condition.

Trend Is Toward Deeper Drilling

With the exception of some possible small stratigraphic traps formed by sand lenses or unconformities, and traps associated with piercement-type salt domes, the future discoveries in the Gulf Coast of Texas and Louisiana will be made by deeper drilling

(Continued on page 194)



TROUBLESOME DRILLING PROBLEMS SOLVED BY Special Muds

by Geo. R. Gray*

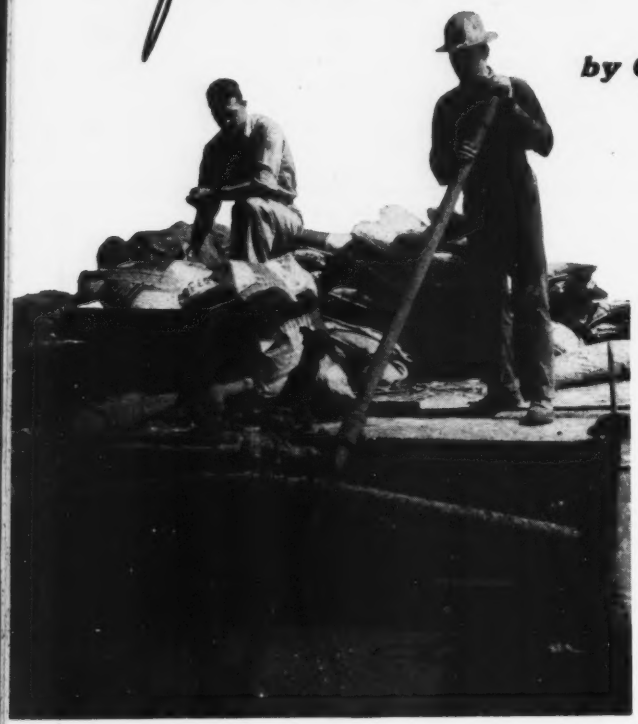
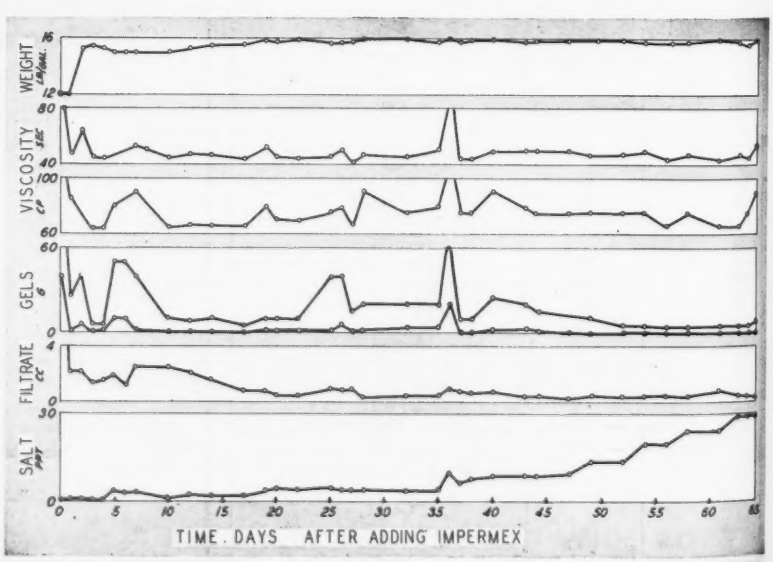


Fig. 1 — (Left) Impermex being added to mud through mud-mixing hopper

IN the Gulf Coast area within the past few years increasing attention has been given to the preparation of muds having properties designed to aid in the solution of specific problems arising in drilling wells. Troublesome conditions which formerly were regarded as hopeless now are alleviated in many instances by the use of special drilling muds.

The principal ingredient in the majority of these "tailor-made" muds has been starch. Neither the preparation nor the maintenance of such muds is especially difficult or expensive, as is evident from a survey of the characteristic examples of the use of starch in Gulf Coast drilling muds which are cited in this paper. These examples show how a long string of casing was set at the desired depth after a salt-water flow; how satisfactory mud properties were maintained in drilling sands bearing salt water under high pressure; how trouble from caving shales was avoided and a comprehensive coring and testing program was concluded successfully; how a mud of good wall-building qualities was made from brackish water, and how at least one string of casing was saved after a well penetrated rock salt.

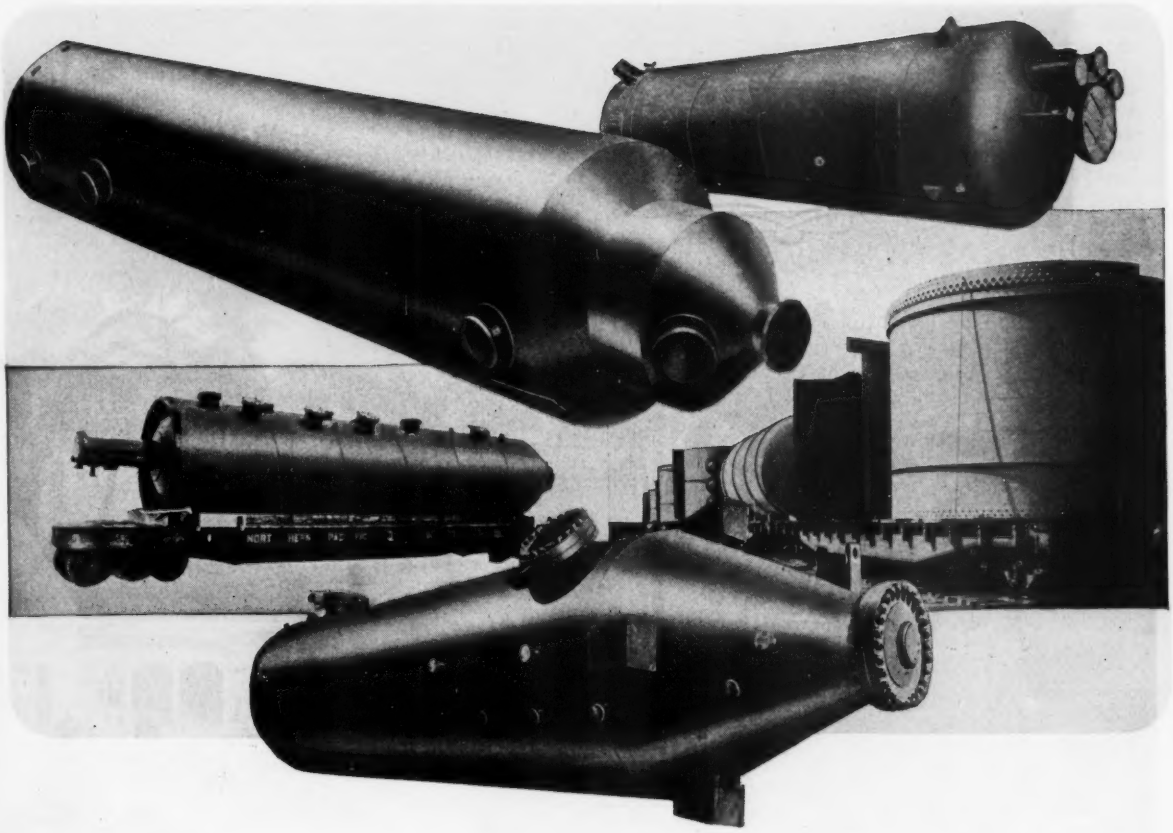
*Baroid Sales Division, National Lead Co., Houston.



Feg. 2—(Below) Properties of high-pH Impermex mud while drilling salt-water sands

Starch

Starch is the principal constituent of many plants and may be concentrated in the seeds, tubers, and roots. Microscopic examination reveals the starch structure as individual granules of characteristic appearance, the major portion of the starch being retained within a membrane. To be effective in improving the wall-building characteristics of drilling mud, the cell wall of the starch granule must be ruptured. This rupture can be brought about by treatment with moist heat or alkaline solutions, singly or in combination. Although ordinary pearl starch can be pasted with alkali and steam at the well, it



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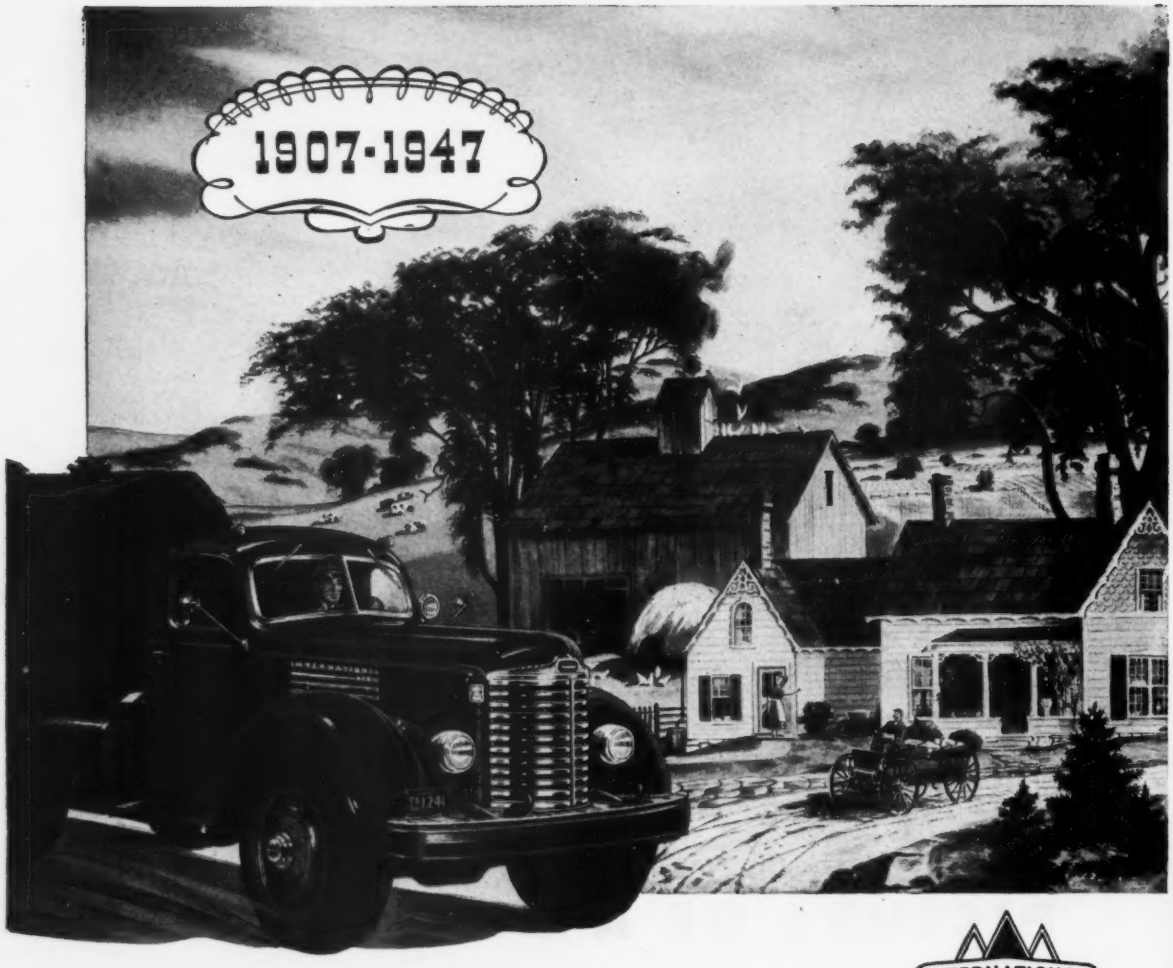

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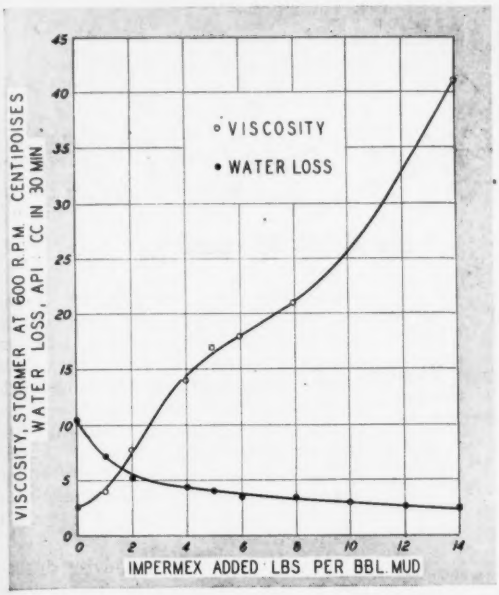


Fig. 3—Effect of Impermex concentration on viscosity and filtration of high-pH mud

is far more convenient to employ the pretreated commercial product available to the oil-well drilling industry under the name of Impermex.[1] This dry starch product can be added through the ordinary mud-mixing hopper, as shown in Fig. 1.

General Procedure for Field Use of Starch

Before adding starch to drilling mud, consideration should be given to means of preventing fermentation. Ordinary mud serves as a culture medium for a host of air-borne microorganisms, as well as for those native to the soil. Various yeasts, molds, and bacteria break starch down to dextrins, sugars, alcohols, acids, and carbon dioxide. By preventing the initiation of fermentation, the manifold difficulties involved in overcoming it are avoided. The likelihood of fermentation can be reduced by adding a poison, e.g., such germicides as creosote, sodium pentachlorphenate, formaldehyde, or phenol.[2] Fermentation can be prevented by making the environment inimical to the growth of microorganisms which attack starch, e.g., by maintaining a high concentration of salt or alkali, or by keeping the temperature of the mud above the maximum at which the destructive organism can survive. The selection of the method to be employed will be affected by such factors as salt content of the mud and makeup water, length of time the mud is to be used, nature of formations to be drilled, and weight and viscosity to be maintained, as well as the cost of the preservative.

After having selected the method to be used to prevent fermentation, and having decided upon the values for weight, viscosity, gel strengths, and water loss which the mud should have, a pilot test is run to determine approximately the quantities of materials to be added to secure the desired properties. The amount of Impermex, for example, may vary from only a few pounds per barrel as is used to improve the wall-building qualities of a brackish-water mud, to 20 lb. per bbl., or more, employed in preparing a mud of exceptionally low filtration to reduce contamination of cores to a minimum. Too much emphasis cannot be placed on the importance of making a pilot test on the mud to be used. The properties of the base mud, as well as the conditions to be satisfied, will affect the quantities of materials needed.

If, as is frequently the case, drilling operations are to be continued while the mud is being treated, all mud in excess of that required for circulation is jetted from the pits. Unnecessary pits are blocked off and dead ends are eliminated from the surface mud system. Guns are arranged to permit thorough agitation of all mud in the pits.

The material to be used to prevent fermentation is always added in advance of the modified starch. Thus if a high hydroxyl-ion concentration is employed to prevent fermentation, a solution of caustic soda or other alkaline material is added, along with such quantities of quebracho and water as are required to regulate the viscosity and gel, until the pH of the mud is between 11.5 and 12.2. Impermex is then added through the hopper to reduce the water loss to the desired value. Similarly, if a germicide is used, the required amount is added before the addition of Impermex is begun. When salt is used to prevent the decomposition of starch by microorganisms, salt is added through the hopper until the concentration in the liquid phase ranges from 15 to 26 per cent, depending upon the presence of beds of salt. If salt beds are exposed or anticipated, the mud is saturated with salt to avoid the formation of solution caverns. Impermex is added following the addition of salt. Salt-Impermex mud is frequently prepared in batches in the pits to avoid the possibility of damage to the hole by circulating the salt-water mud prior to the addition of Impermex.

It has been demonstrated many times that all of the hazards of a salt-water flow are not eliminated as soon as the mud weight has been raised high enough to stop the influx of salt water. Salt water which has already entered the mud flocculates the colloidal clays. The water loss goes up rapidly, with accompanying difficulties caused by thick filter cake and sloughing of shales. Serious consequences which may result are sticking of drill pipe and flooding of productive sands.

These possibilities confronted an operator in a gas-condensate field after striking a salt-water flow below the productive sands. While drilling at 11,828 ft. with mud weighing 10.5 lb. per gal., the well began to kick. Viscosity and water loss rose rapidly. After the weight had been brought up to 12.5 per gal., only a little salt water entered the mud and the salt content leveled off at about 36,000 p.p.m. Trouble was had in rotating and it appeared that the pipe might stick.

Several thick sections of permeable sands; about 9,800 ft. of open hole, principally shale, and a crooked hole at 8,900 ft., made it imperative that a low-water-loss mud be introduced before attempting to come out of the hole to run casing. High pH-Impermex mud was recommended. It was estimated from test samples that 2.5 lb. of caustic soda, 3.5 lb. of quebracho, and 7 lb. of Impermex per barrel of mud would be required. Volume of mud in the system was about 1,800 bbl. Accordingly, 6,300 lb. of quebracho and 4,950 lb. of caustic soda were added. Impermex was added then at the rate of 1,500 lb. per hour. Water loss dropped from 60 to 11.4 cc. as soon as returns were had on the Impermex mud. After 11,700 lb. of Impermex had been added, filtration was about 4 cc.

After the water loss had been reduced to 4 cc., the drill pipe was pulled out of the hole and a pilot bit was put on. On going back in the hole, the mud was circulated from 8,000 ft. and from 10,000 ft. before going on to 11,720 ft. First returns of mud from the bottom section were badly gas cut. An increase in volume of mud in the pit showed the influx of salt water. Clear salt water flowed for about 10 minutes. Although most of the clear water was diverted from the pits, the salt content of the mud rose to 50,000 p.p.m. Filtration increased to 18 cc.

Baroid was added rapidly to raise the weight to 14.5 lb. per gal. Impermex was added to lower the water loss to 4 cc. Shortly after the weight of the mud from bottom reached 14.5 lb. per gal, returns were lost. The bit was pulled up to 1,950 ft. in the casing to mix mud. Sufficient mud weighing 13.8 lb. per gal. was mixed to fill the hole and the pit. The mud was circulated at intervals of about 2,000 ft. while running the bit in to 11,750 ft. and the weight was ad-

(Continued on page 239)

PORTABLE EQUIPMENT EXPEDITES INLAND

Marine Seismic Surveys

by A. B. Hamil*

Fig. 1—Marine Exploration Co.'s complete recording unit in center of photograph. This unit, which includes camera, amplifiers, test panel, and 24-trace galvanometer block, weighs only 55 lb. including a waterproof stainless steel carrying case. This recording equipment was designed and manufactured by Technical Instrument Co.

Fig. 2—(Left) The 24-trace seismic record obtained with unit shown in Fig. 1. Field tests with this small unit coincide with seismograms taken by heavier, less portable type of equipment over same area. Fig. 3—(Right) One of Marine Exploration Co.'s party men carrying developing unit through Louisiana swamp

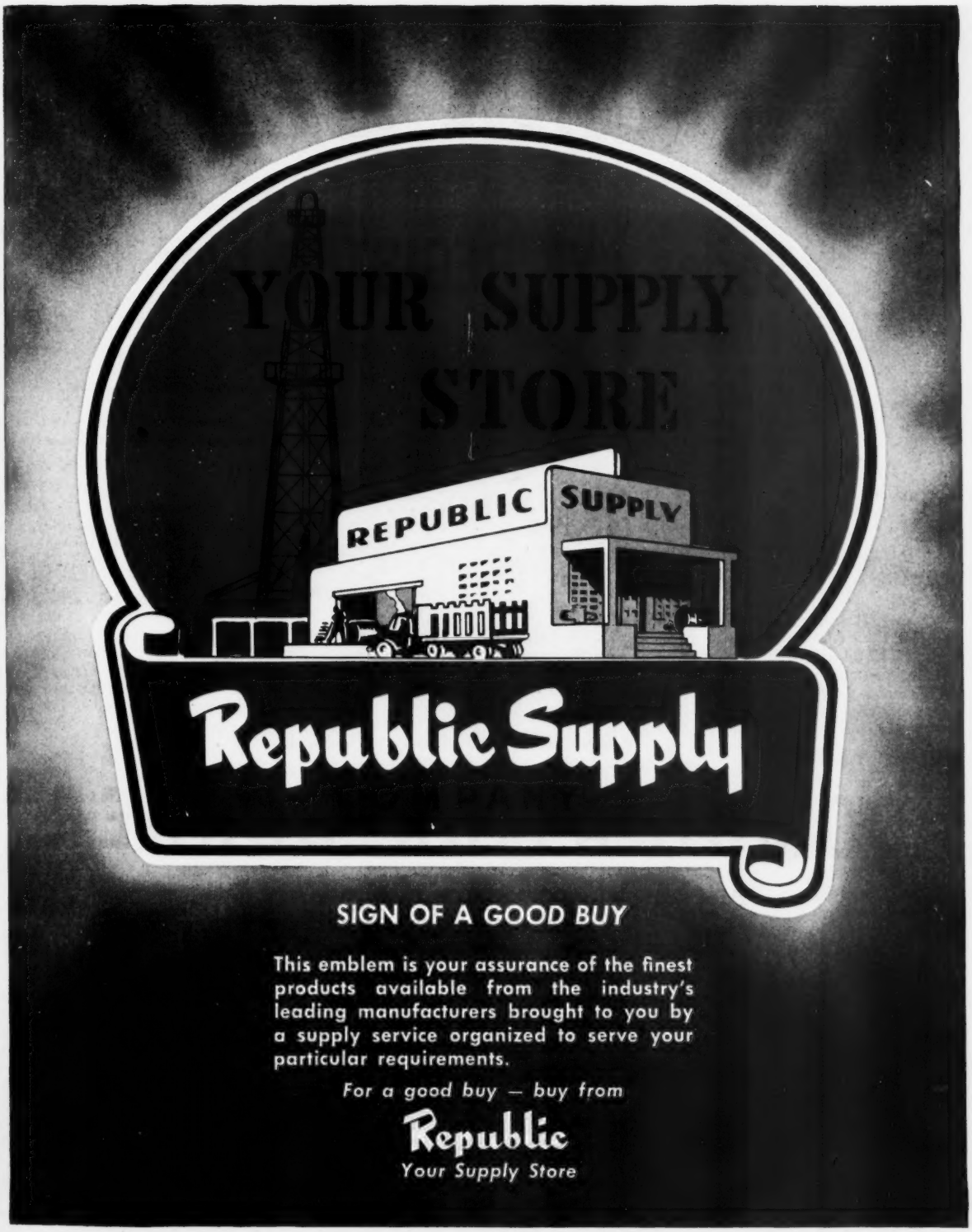
THIS article restricts its subject primarily to inland marine seismic surveys and compares such operations briefly with offshore marine seismic surveys currently concentrated coastwise in the Gulf of Mexico.

*Owner-director of Marine Exploration Co., Houston.

Inland marine surveys include the tidewater marshlands and swamps of Southern Louisiana; the long reaches of the Atchafalaya Basin and the Mississippi Embayment extending north 200 miles from the Gulf; the coastal areas and inland bays of Florida, Alabama, Mississippi, Louisiana, and Texas; the fresh water lakes; inundated river bottoms; and flooded rice fields and spillways of the riparian areas. The mode of operation extends farther to include the enormous high land areas, inaccessible to the average seismic equipment, and the immense foreign areas, presently under intense investigation, in which either terrain or isolation from transportation eliminates the use of standard equipment.

The complexity of radically different terrain, having inaccessibility as its only common denominator, along with the regional variation of the geologic section, both surface and subsurface, ranging from Wilcox-Vicksburg exposures in Northern Louisiana to an unpenetrated Marine Miocene section along the coastline, requires the undivided attention of highly trained and experienced geophysicists, seismologists, and field operating personnel. To increase the difficulty of such surveys, the type and size of oil-bearing structures is frequently diminutive, dependent on complicated faulting, low-relief structural closure, and stratigraphic traps making necessary the most exacting thoroughness in the exploration technique. Shot-hole depths, hole fatigue, instrument-spread lengths and instrument locations, surface elevations, weathered layers, near-surface and subsurface velocities, frequency attenuation, dip migration, and correlation and interpretation of seismograms must be observed, regarded, and resolved in the detailed interpretation of such areas with the highest degree of efficiency obtainable in seismic operations. Offshore operations to date are being conducted as dip average, noncorrected reconnaissance programs making no use of weathering data, correlation, or precision locations, and resolving data from suspended or bottom-loaded explosive charges. This method is designed as a technique to divulge oil-bearing structures of tremendous magnitude, comparable to the largest inland salt-dome structures and worthy of the excessive cost of exploration and drilling. In this manner, interpretation has become secondary and field operating equipment and technique primary. The latter has rapidly become one of the most intricate and interesting problems since reflection technique replaced refraction surveys.

Field equipment for offshore sur-



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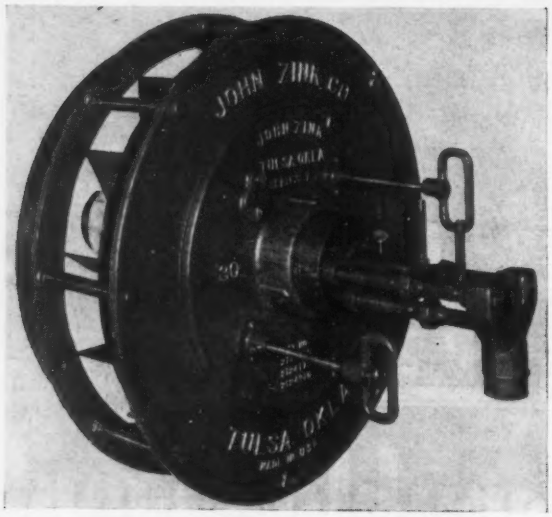

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Fig. 4—One complete unit. From left to right: developing unit, recording unit, power supply and cables. Shot holes have been prepared by portable drilling unit which is carried by four men

veys need be limited only by the imagination and the size of the purse and may be restricted in size only to the available deck, hold, and cabin space of vessels ranging from 20,000 to 200,000 lb. displacement and measuring up to 175 ft. in length. Inland marine equipment, to be efficient in operation, production, and exploration cost, must be portable, or at least in a combination of various packages permissible for hand portage and preferably in unitized, compact, waterproof, lightweight complete units easily conveyed by one man. In addition to the specialized electronic seismic instruments, provisions for compatible drilling, shooting, and surveying equipment must be made; special shot-hole casing must be used where necessary, and provisions for the safety and subsistence of personnel must be considered. In land areas of soft terrain, the exclusive use of all-wheel-drive vehicles, employing at times dual or triple wheels front and rear, tire chains, and efficient winches, and driven by experienced personnel, provides high production at low cost. In marsh areas, the use of modern amphibious marsh buggies reduces the difficulty of transportation, as do suitable boats in waterways. However, some water areas offer such shallow depths that specially designed "mud boats," capable of running in 6 in. of water, or hydroplanes (airboats) must be employed. Of the most importance in all such instances is the portability of equipment, as weight is the prime factor in transportation and space is restricted in usable vehicles.

Through a combination of experience, gained over a period of 15 years of operation in domestic marine areas and in foreign concessions, and extended research in equipment and instruments, specialized seismic instruments of the most efficient design employed to date have been constructed in a unitized package. It contains a 24-trace recording daylight-loading oscillograph, having a capacity of 200 ft. of 6-in. photographic paper and employing a governor-controlled electric drive motor with adjustable paper speeds of 9 to 14 in. per second, a synchronous timing motor and a constant-speed vacuum-tube-driven timing fork, individual galvanometer deflection controls, and light-proof receiving magazine with a positive-cutting seriated knife. Included are a built-in 30-cycle oscillator; communication and time-break system arranged for radio, telephone or speaker-amplifier; an adjustable suppressor unit permitting selection of initial and over-all suppression by time and amount; and a master bias control for over-all adjustment of amplifier sensitivity. The package also contains 12 high-gain seismic amplifiers sealed in individual cylindrical containers with automatic volume control established by constants, which are determined by energy-ratio changes instead of small signal variations. This eliminates distortion or omission of phase changes and correlation character of incoming signals and permits a constant signal level throughout the record. Eight filter positions permit the maximum range of frequency attenuation. Each amplifier weighs only 1½ lb. All connecting cables are soldered and no plugs are used, thus eliminating contact trouble.

One-Man Pack

The entire equipment listed and described above is packaged in one stainless steel waterproof case only 19 in. high, 16 in. wide, and 11 in. deep and weighing only 55 lb. It may be carried in the most difficult terrain by one man using a U. S. Army Arctic rucksack of tubular aluminum and web-strap construction. (See Figs. 1, 2, and 4.) This compares with a full infantry combat pack of 63 lb.

The power-supply unit consists of one 6-volt automotive battery mounted integral with a dual-purpose genomotor supplying 350 volts to the fork amplifier and 90 volts to the plates. It is contained in a stainless steel waterproof case, which includes the interconnecting power cable. This unit weighs approximately 60 lb., depending on the weight of the storage battery used, and is also portable for one man using an Arctic rucksack. (See Figs. 1, 2, and 4.)

The portable developing equipment consists of four stainless steel tanks containing developer, hypo, glacial acetic acid, and wash water. These four tanks are contained in one waterproof case with a black hood permitting the insertion of the arms to manipulate the seismogram in the processing solutions. The total weight of this unit is approximately 50 lb., 32 lb. of which is 4 gal. of water solution, and is easily carried by one man in an Arctic rucksack. (See Fig. 3.)

The three units above are transportable by only three men and comprise a complete set of recording and developing equipment. In addition to the above, one portable master geophone cable, constructed of 26-gage magnet wire, is used with a portable breast reel—total weight only 40 lb. This unit is carried in front or back on a specially designed leather vest with protruding hooks. (See Fig. 4.)

Lightweight Recording Equipment

Geophones, weighing only 3½ lb. each or 42 lb. for 12 positions, are also easily carried by one man. A combination of the above equipment permits dual 12-trace recording simultaneously, 12 straight circuits and 11 composited circuits simultaneously, or interpolative intermediate 50 per cent combined mixed traces alternating with 12 straight circuit traces, which permits the lengthening of spread distances without difficulty.

The total recording equipment, including geophones and cables, weighs only 250 lb., is easily transported by five men, and is ready for immediate use on reaching an instrument set up as it is necessary only to plug in the power supply.

Marine Exploration Co. is employing the only complete sets of unitized portable seismic equipment, as described above, in the field to date and such instruments are being designed and manufactured by Technical Instrument Co. of Houston. Auxiliary equipment such as developing apparatus, geophone cables, breast reels, etc., are designed and manufactured by Marine.

The above equipment pertains only to the recording phase of seismic operations.

The shooting unit is aided greatly by the development of these new

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modern efficient instruments as the ultrahigh gain reduces the necessary explosive charge by approximately 75 per cent and the improved record quality reduces the total number of shots. This provides for greatly reduced explosive consumption and permits a day's supply to be carried easily by one man along with a portable blaster and communication unit. Light-weight-metal loading poles and an uphole detector complete the items needed, and only two men are required to transport the equipment load the explosives, and detonate the charges.

The portable drilling equipment consists of a 65-lb. motor-driven aluminum pump, suction and discharge hoses, and lightweight drill stem rotated with chain tongs or pipe wrenches. When casing is required to sustain the walls of the shot hole thin-wall steel casing, weighing only 1.5 lb. per ft., is used as drill stem and left in the hole on completion Such operations require additional personnel to carry casing but eliminate two men carrying drill stem. Equipment for drilling 50 holes, including fuel, tools, and bits, can be carried and operated by only four men. When surface formations are too consolidated to permit hand-jetting operations, small portable mechanized drilling units provide essentially the same performance as larger truck-mounted drills.

Aluminum-Base Units

Portable units, designed and manufactured by Carey's Machine Co. of Houston, consist of an aluminum base weighing only 250 lb. on which the draw works, rotary, shafts, clutches, and drive mechanism are mounted. There is also a demountable air-cooled driving motor weighing less than 100 lb., a separate motor-driven pump weighing as little as 65 lb. on the 7,000-gal.-per-hour units, and a 17-ft. aluminum mast weighing 55 lb., which breaks into two sections of 27½ lb. each for portage, and completes the unit for use of 10-ft. drill stem. A 10-ft. mast for use with a 7-ft. kelly and 5-ft. drill stem is also available for extremely rough terrain.

Surveying is performed in the usual fashion using a surveyor and rodman with either transit or alidade and surveyor's chain. In general, brush-cutting is unnecessary as no motorized equipment need be moved along the line.

Frequently, the great distances from mobile transportation and the type of terrain warrant an over-all increase in the total number of men required to allow for relief porters.

The application of such equipment to truck work permits the use of lightweight all-wheel-drive units of small capacity such as jeeps, WDX power wagons, and surplus army vehicles.

(Continued on page 156)

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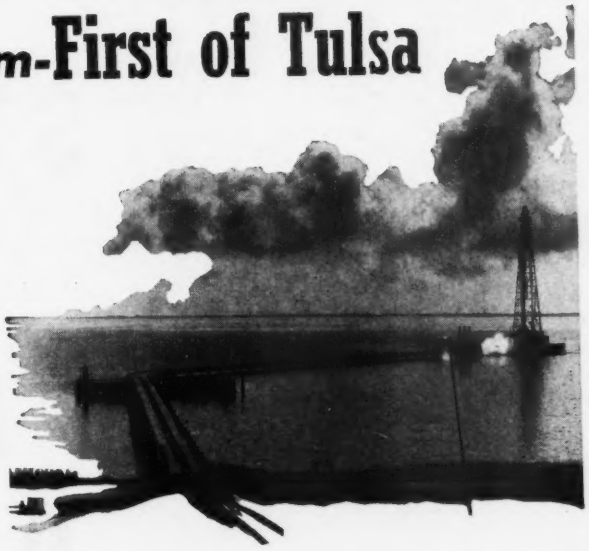

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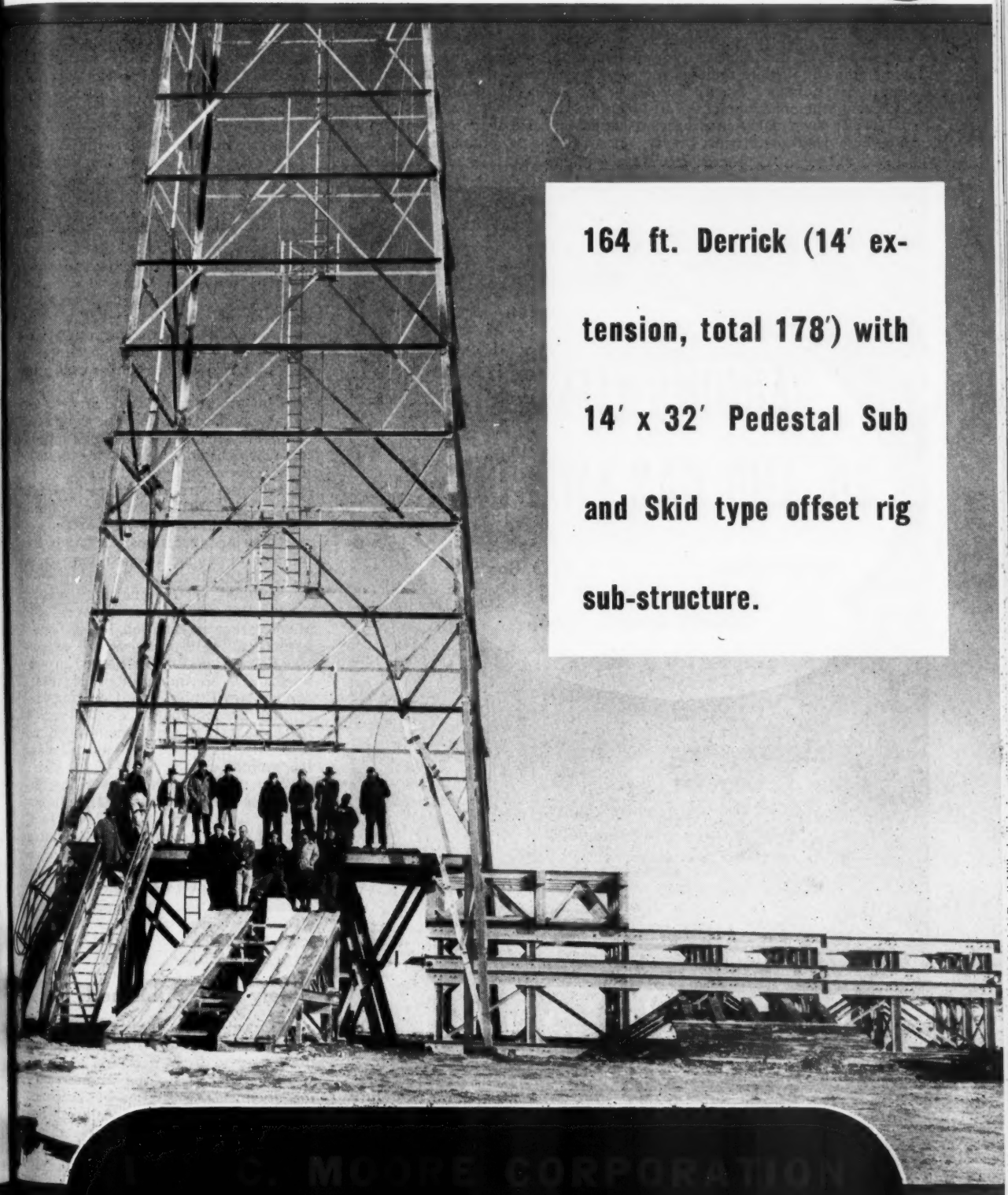

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In such operations, truck-mounted rotary-drilling rigs, weighing 1,000 to 1,500 lb., increase drill production and reduce personnel. Portable drilling equipment is carried along so that continuous progression of the desired survey line may not be impeded by locations inaccessible by truck.

Mounting of Equipment

Shooting and recording equipmen is mounted in or on trucks in such a manner that immediate removal for portability is possible. Such procedure prevents the abandonment of desired lines or even delay in progress and prevents destructive truck breakdowns normally incurred by attempting to force the vehicle beyond its limit of mobility.

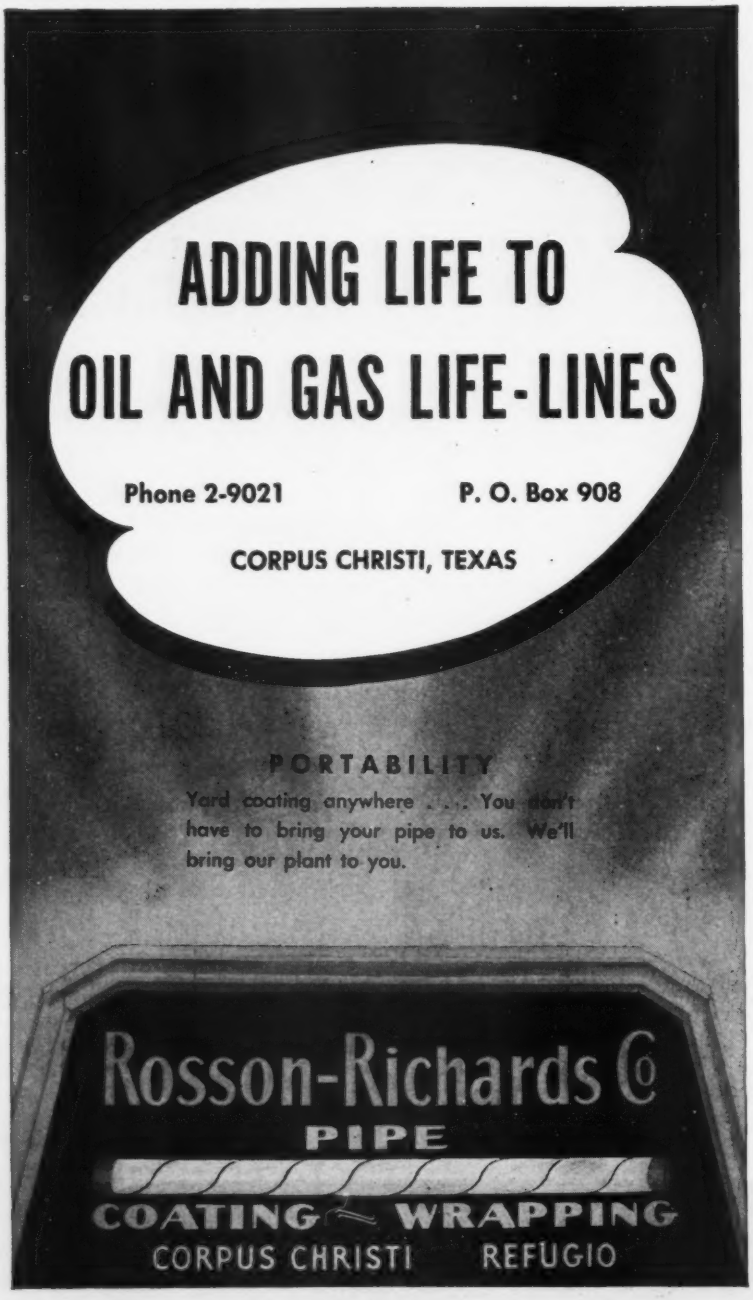
Surveying is normally a portable or semiportable operation with transportation to and from the assigned prospect being the only major requirement of a vehicle.

Such operations as described above are more efficient than comparable surveys conducted with heavy instruments, heavy equipment, and conventional-drive heavy trucks, not only in the cost of exploration and in the option-time factor, but in obtaining valuable cross-country information not previously obtained due to the inaccessibility. Over-all it must be assumed that the traversible road and trail system throughout the oil-producing areas has been thoroughly investigated numerous times by competent seismic surveys producing similar or identical data. Consequently, obvious anomalous conditions attributable to oil-bearing structures were discovered. Frequently, however, optional contouring and the date of such surveys failed to create enough interest in such areas to warrant painstaking expensive off-the-road surveys.

Apparently, the most desirable areas in which to explore for oil are those not previously investigated. Such areas in oil-producing zones are restricted to areas heretofore considered inaccessible to the average equipment. As outlined above, considerable high land area is added to the vastness of the coastal marshes and swamps, totaling millions of acres of unexplored or insufficiently explored areas. Rapid inroads are being made in such areas and the structural recovery and subsequent production have proved to be well worth the effort even at the present high cost. Still some portions of some areas must be abandoned due to the weight of standard portable recording equipment, which alone weighs up to 1,500 lb. and is generally packaged in either 50-lb. containers or grouped where necessary in 100-lb. packages requiring two to four men for portage.

In foreign operations, although the number of men employed may be a minor expense and is frequently set by national regulations requiring a prescribed number of natives per alien worker on each job, bulky heavy equipment still produces an expensive delay along with repeated breakdowns due to the number of interconnecting cables required for assembly. Unitized portable seismograph instruments and equipment need no assembly time and greatly increase the production.

With increasing interest being focused on the Gulf Coast marine areas by the oil industry, it is believed that, with the application of the portable methods and equipment described in this article, all unmapped areas previously thought to be inaccessible to seismic operations can now be considered potential areas for geophysical exploration.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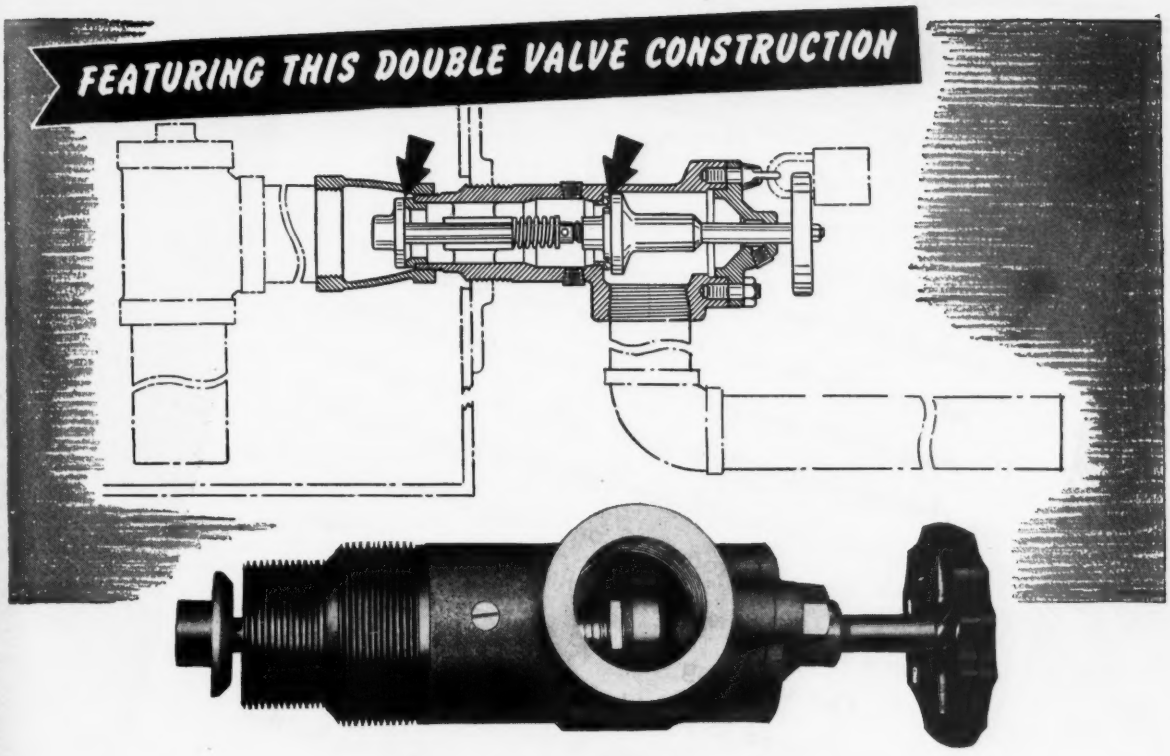

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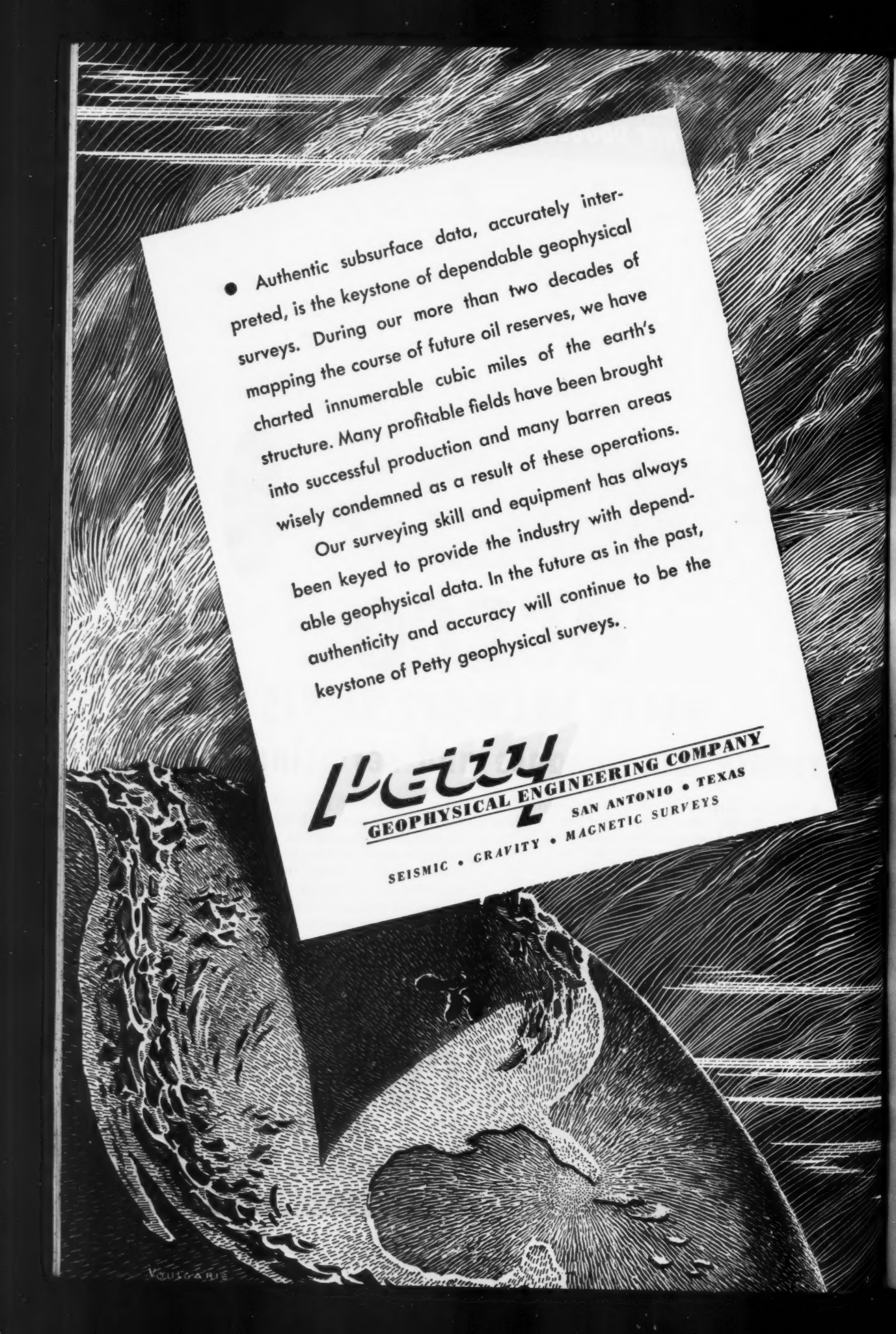
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The Gulf Coast—Petroleum Center

(Continued from page 125)

magnitude of 1 trillion cubic feet annually, which would represent less than 2 per cent of the known reserves. Gas reserves discovered in recent years have been larger than production, resulting in additions to known reserves. Gas - conservation projects have been developed to a particularly high degree in the fields of the Gulf Coast area.

Natural gas is potentially one of the most valuable resources of the Gulf Coast area. While present gas prices are low at about 5 cents per thousand cubic feet, which represents only one-sixth as much as the price of crude oil for the same heat value, they should improve substantially within the next few years because of the growing demand and the development of processes for converting natural gas into liquid fuels and chemicals so as to secure a better realization. In the meantime, gas supplies serve to attract chemical plants and other industries to the Gulf Coast, and gas-conservation projects help save gas for the future when there will be a good demand at higher prices.

Natural Gasoline and Cycling Plants

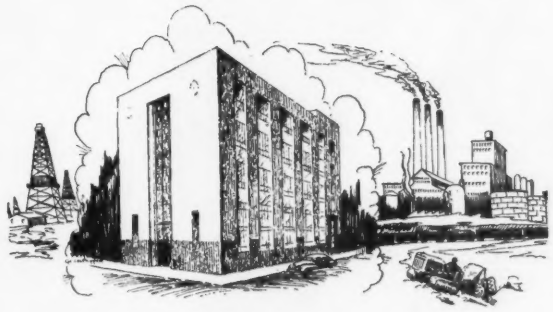
The Gulf Coast has 80 plants processing over 3 billion cubic feet of gas daily and recovering about 82,000 bbl. per day of natural gasoline, butane, propane, and other products which are in growing demand by the chemical industry as well as by petroleum refiners. The plants in this area account for 25 per cent of the total production of natural gasoline and allied products in the United States. The cycling plants in particular represent a progressive conservation achievement by the industry. These plants process gas for the recovery of liquid products and return large quantities of the residue gas to the formation, in order to increase the recovery of liquid hydrocarbons from the reservoir and to save the gas for future use.

Refining

The greatest concentration of oil-refining facilities in the world is on the Gulf Coast. About 35 refineries in the Houston, Beaumont, Corpus Christi, Lake Charles, and Baton Rouge areas have a capacity of about 1,600,000 bbl. daily. The Gulf Coast has the largest refineries in the United States. There are three plants in the area which process over 175,000 bbl. per day each, two plants which run about 125,000 bbl. per day each, and four which run between 75,000 and 100,000 bbl. per day each.

Refineries in the area receive crude oil not only from the Gulf Coast but

DISPOSED TO SERVE



A high percentage of the Nation's Oil and Gas activities is concentrated in the Gulf Coast—and much of it within a 100 mile radius of Victoria. The development of this industry vitally affects the economic welfare of this area.

Our credit relations with responsible drilling contractors and the owners of leasehold interests have proven mutually satisfactory. Our lending capacity to any one individual, corporation or firm is now fixed at $500,000.00. Furthermore our connection with other banks is such that our lending capacity extends far beyond the figure mentioned. Thus it is but natural that we invite inquiry from experienced operators who may need money for exploration, production, refining or transportation purposes.

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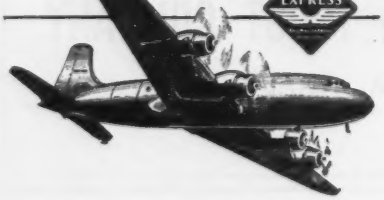

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also from numerous fields located at considerable distance from the Coast. About 40 per cent of the crude oil run to stills by Gulf Coast refineries is supplied from West Texas, North Texas, East Texas, North Louisiana-Arkansas, and North Mississippi.

Refining is the major manufacturing industry of the Gulf Coast area. The value added by refining crude oil into products is estimated to be about $275,000,000 for Gulf Coast plants. These refineries provide employment for about 40,000 people, at estimated average wages and salaries of $3,500 annually, indicating a payroll of $140,000,000.

The products of Gulf Coast refineries flow primarily to the East Coast and foreign markets. Only a relatively small part of the products refined in the area are consumed within the Gulf Coast states.

Transportation

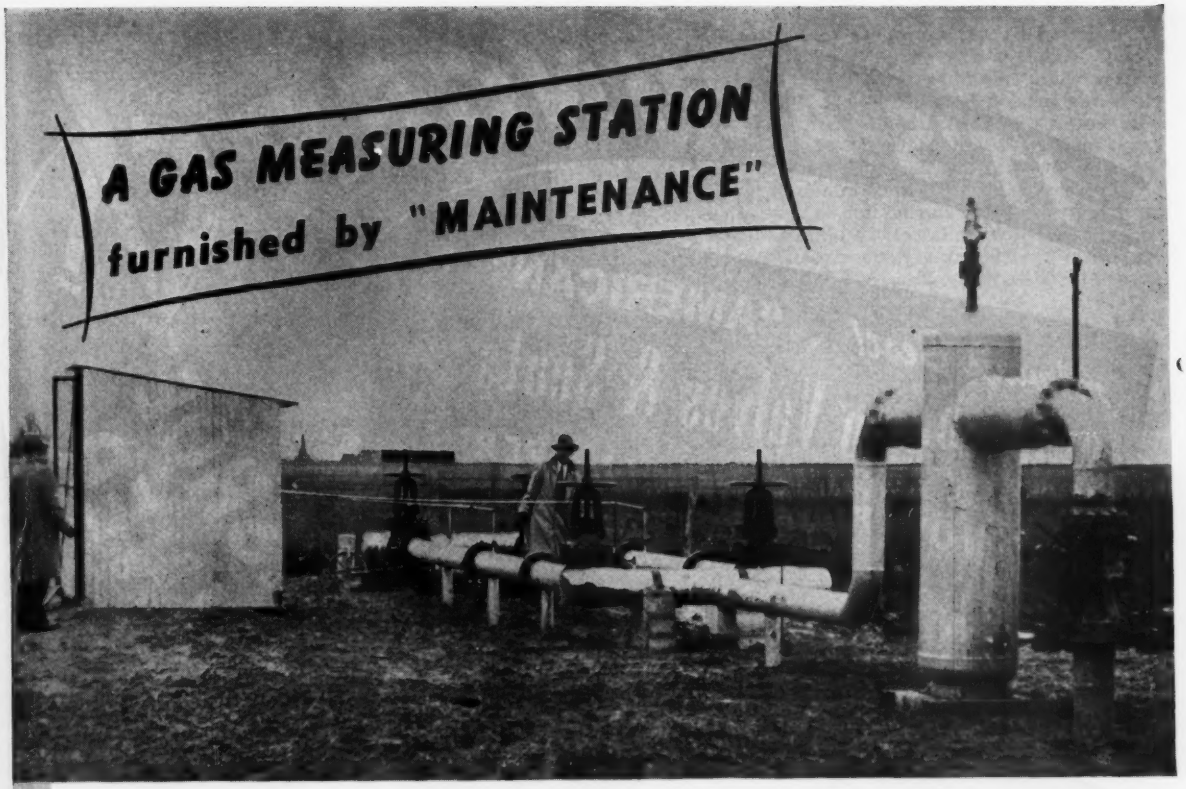
Through the Gulf Coast area and its ports flows a large part of the oil that moves in interstate and world commerce. The principal volumes are moved by tankers, which currently are moving out about 1,675,000 bbl. per day of crude oil and products. In addition, barges transport over 100,000 bbl. per day up the Mississippi River and there are several pipe lines moving about 125,000 bbl. per day of crude oil and products out of the Gulf Coast area to interior markets.

A network of pipe lines serves to bring oil to Gulf Coast refineries and ports from an area several hundred miles inland. The flow of oil to the Gulf Coast continues at record levels, although increasing quantities of oil are being moved from Texas into the Mid-Continent in order to supplement declining production in that area.

Future Outlook

The petroleum industry in the Gulf Coast has been in the process of development for more than 45 years. The rate of growth continues to be rapid, as evidenced by the fact that in the past decade crude-oil production and refinery crude runs to stills in the Gulf Coast area have more than doubled. In spite of the intensive development that has occurred, there is still a great deal of exploration, drilling, and expansion of facilities being carried on in the area.

The rate of growth for the future will probably not be so rapid as in the past, but there is every prospect that the Gulf Coast will continue to be a dominant factor in the world petroleum industry for a number of years to come. Even with respect to development of new oil reserves, import potentialities still exist, particularly in the less thoroughly explored area east of the Mississippi River, and on the Continental shelf under the waters of the Gulf of Mexico.



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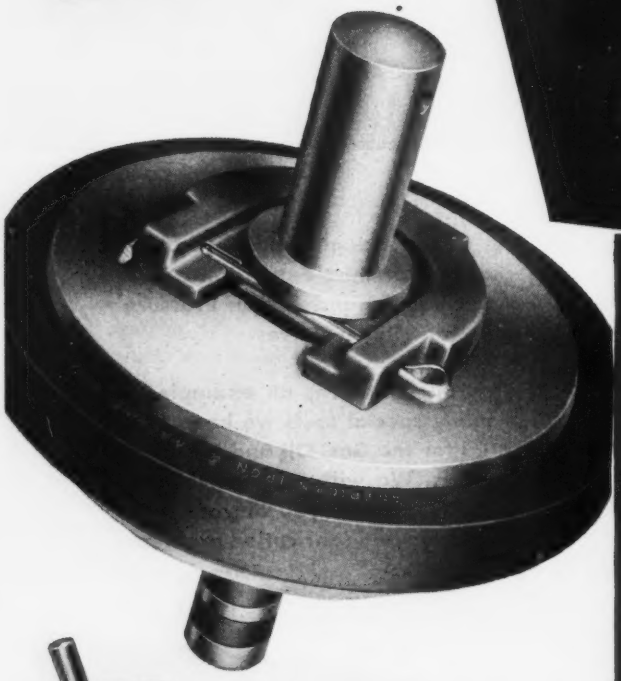

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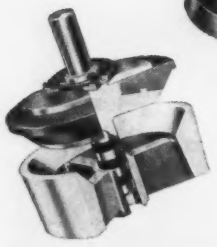

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Paraffin Removal

(Continued from page 135)

knife is run on a set of jars to aid in cutting tight places and thick accumulations, and is suspended on a wire line inside a lubricator fastened to the top of the christmas tree. The unit is mounted on skids in a pick-up truck and is powered by a small gasoline motor.

Two men operate the cutting-tool unit, and the normal accumulation in a flowing well (2 to 3 weeks) will require 1 hour's cutting for removal. The paraffin-scraping unit, mounted on skids and complete with jars, cutting tools, and lubrication, can be assembled for approximately $650 to $700. In some gas-lift wells cutting is required every other day. The knife cannot be used to clean the flow lines.

The rabbit or go-devil has advantages in that no extra labor is required. The rabbit is placed in a lubricator on top of the christmas tree. A special catch in the lubricator is set so that a horizontal pull by the lease gager will start it on its way downward in the tubing string. By increasing the rate of flow from the well the rabbit is supposed to flow back to the surface and become lodged in the surface lubricator. The use of this rabbit appears to be very limited in flowing wells. Our experience to date in gas-lift wells has been encouraging, especially in those which normally require scraping every 48 hours. In a gas-lift well sufficient velocity is obtained to adequately flow the go-devil to the surface. The rabbit may be run whenever the surface lever is pulled, or can be permitted to make a trip with each flowing cycle. A stop or bumper is placed in the tubing string below the point where accumulation occurs. This stop can be run or retrieved without pulling the tubing. The unit we have in service sells for $200. The rabbit will scrape only very thin accumulations of paraffin. In wells normally scraped every 48 hours we find it advantageous to let it operate continuously with each gas-lift cycle. When it can be used, in smooth, clean tubing on gas-lift wells, it is a substantial saver over manual cutting methods. Additional work is being done on a rabbit which will better stand the wear of several daily trips in the tubing.

Since all wells are producing with tubing set in packers, it is not practical to inject solvents into the annular space. The use of a macaroni string inside the 2-in. tubing is not justified on the basis of poor results obtained by solvent injection into the flow lines. All available solvents have been tried, but none has offered much encouragement in the solution of the problem. Most solvents used are sold from $1.50 to $2 per gallon. Costs of such solvents further limit the prospects for use of them.

Other methods not tried, but which have been recommended to us from time to time, include use of chemicals which produce heat upon reaction, and heating the tubing string by means of electrical current.

In handling wax precipitate in the flow lines, steaming with the portable unit has been most satisfactory. The time required to thoroughly clean a 1,500-ft. flow line from the well to the tank battery ranges from 1 to 2 hours, depending upon the amount of accumulation in the line. Solvents have been added by means of gas-operated injectors into the individual 2-in. flow lines. Results to date have not been encouraging. At the present time ice cream salt is being tried. There is a patent on this process. The salt is supposed to possess abrasive characteristics which will clean the flow line. Water in the system will dissolve the salt and prevent accumulation of solid particles in the separator or gun barrel. Type of deposit and length of flow line will govern the success of this method of cleaning. A hard deposit which will cut when it comes in contact with the rough angular salt crystals seems best adapted to this treatment.

In a long flow line our experience has been that the paraffin will collect

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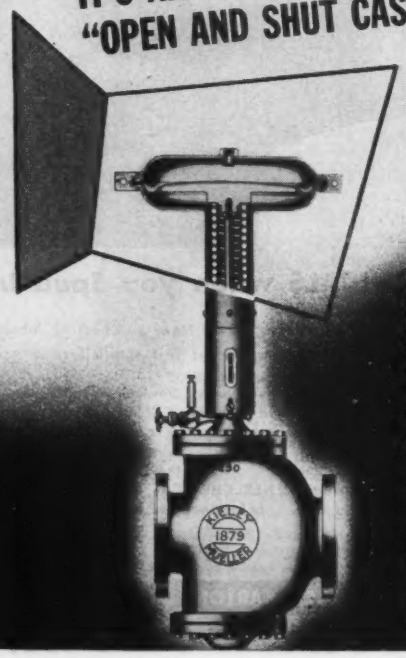

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and "ball up" and tends to plug the line when cut by salt crystals, if an appreciable amount of paraffin has been allowed to accumulate in the flow line prior to the introduction of salt crystals. Further experiments are being conducted using salt crystals by first cleaning the line thoroughly with the portable steaming unit and then periodically (every 2-3 days) introducing 10-12 lb. of rock salt crystals into the flow line at the christmas tree. The absence or presence of paraffin in the flow line is indicated by a pressure gage graduated in 5-lb. increments located on the flow line at the christmas tree back of the choke.

Soluble plugs are now available for pumping through flow lines. We have not tried these, but in some flow lines they are reported to be satisfactory. The plugs are soluble to prevent complete line stoppage if they become stuck, and are flexible enough to go by turns and bends in the flow lines. Another suggested method of keeping down flow-line accumulation is reported to be the stringing of wire line loosely inside the flow line. Movement of the fluid through the line is supposed to cause the wire to scrape the sides of the line. Some work has been done on coating the inside of flow lines with a substance to give the surface a glossy smooth finish. This is supposed to reduce the tendency for paraffin to adhere to the walls of the pipe.

The remaining place in the production system where paraffin may accumulate is the separator, gun barrel, or stock tanks. This may present the most serious problem of all. Removal of this accumulation in the tanks, etc., may be accomplished by rolling with paraffin solvent or by heating and drawing off in a fluid state as bottoms. Such bottoms may or may not be of special demand. Some interest has been shown in the paraffin being handled by us, but due to relatively small volume and cost of collecting into tank cars (to be borne by us) nothing definite has resulted.

During the war, work on high-melting wax (microcrystalline) resulted in an improved product which was not brittle when cold, retained flexibility, and had good waterproofing characteristics. Some petroleum waxes (bottoms) may have a market outlet in the field of microcrystalline wax.

By means of a heater-treater we have materially reduced the tank-bottom problem. The heater-treater is a combination heater, separator, and gun barrel. A unit 6 by 28 ft., capable of handling 400-1,200 bbl. of oil per day and 2-4 million cubic feet of gas, can be purchased at a cost of approximately $3,050. By means of heat, chemicals normally used in the treatment of emulsions can be reduced or eliminated. In addition, a stable product is delivered to the stock tanks, eliminating a gravity and volume loss. It is probably due to a cleaner separation of oil and water and a more stable product in the stock tanks that has reduced the paraffin accumulation. By means of the heater-treater we have reduced our paraffin accumulation in the stock tanks 60 to 75 per cent. When bottoms do build up, they can be circulated back through the heater-treater and further reduced.

The above crude, originally containing 10 per cent wax by weight, is transported through a 6-in. pipe line a distance of 32 miles by an affiliated company. To keep the 6-in. line free of any deposition a scraper or go-devil is pumped through the line periodically. This scraper contains a radioactive bullet inserted in the front end. Should the scraper become stuck in the pipe line, a Geiger-Muller counter is available to locate its position.

Conclusions

The treatment of paraffin is still an individual field or area problem. Composition and texture of the deposit will determine what treatment will best work. No universally successful treatment has yet been found, although all of the above methods have been tried and found to be satisfactory in some particular case.

Coal tar pitch, highly refined, forms the best natural protection against the causes of corrosion. Be sure to use a thick seamless coat of

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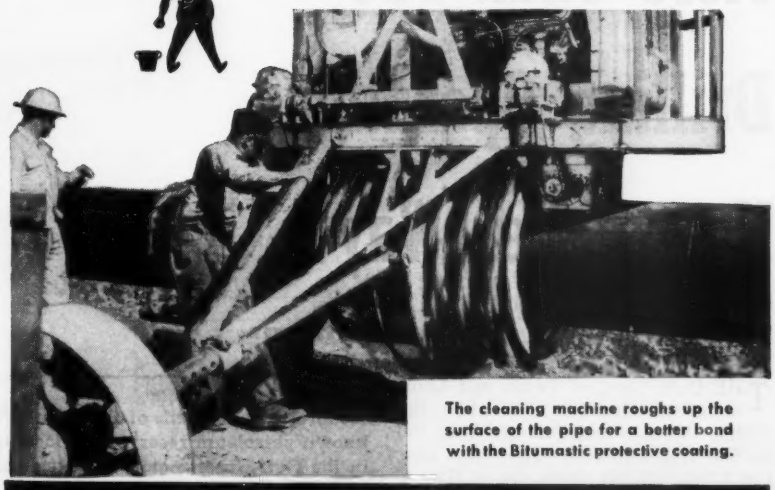

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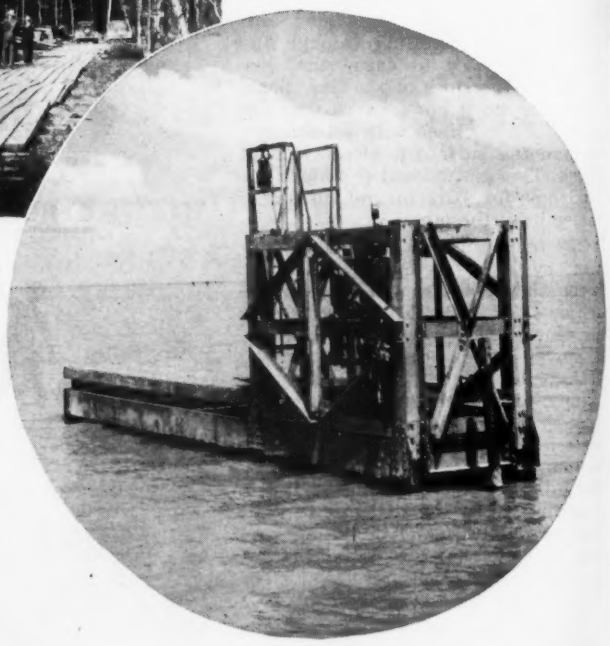


More Than 500 Drilling Operations Now Under Way

by Neil Williams

More than a fourth of the country's known petroleum reserves are located in the Gulf Coast region of Texas and Louisiana. Despite intensive exploration and development carried on for many years, potentialities still are considered far from exhaustion. A steadily increasing amount of drilling is forecast for the remainder of 1947 and 1948 with exploration being extended to deeper horizons and to the Continental shelf.

THE Gulf Coast of Texas and Louisiana stretches 800 miles along the Gulf of Mexico and extends from 100 to 150 miles inland. The area now has a total of 869 fields, as of May 1, with an accumulated oil production up to March 1 of more than 4,323,370,000 bbl. The estimated remaining proved reserve is approximately 6 billion barrels. During 1946, it produced more than 432,733,000 bbl., or about 25 per cent of the country's total of 1,748,772,000 bbl. for the same period. Current production is at the rate of around 1,153,575 bbl. daily.

Seven fields on the Gulf Coast have produced in excess of 100,000,000 bbl. each. These are listed in the following tabulation:

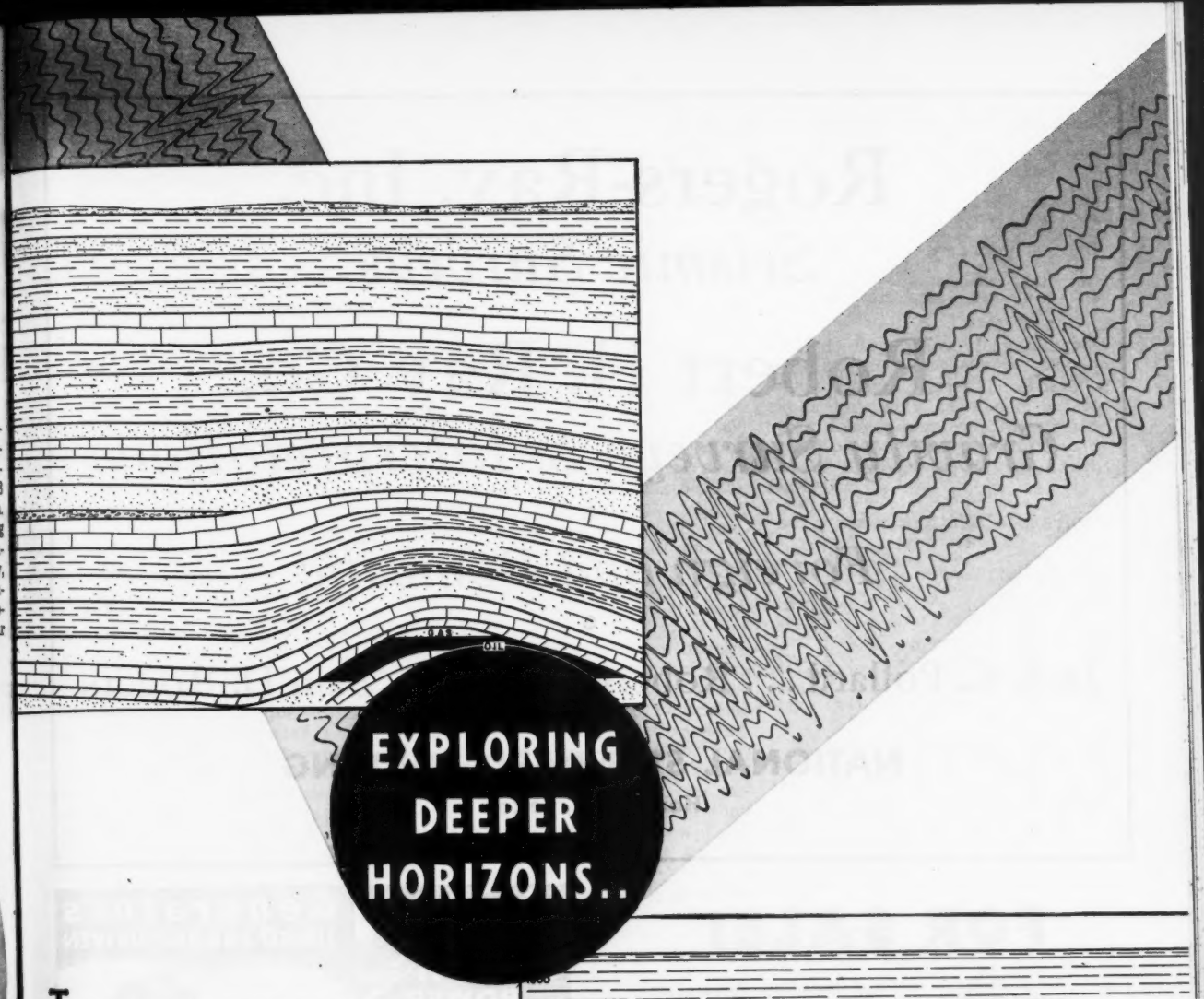
Field, location (county)*—	Year discovered	Accumulated production, 3-1-47 (bbl.)
Conroe, Montgomery	1931	230,337,420
Humble, Harris	1905	130,877,799
Hastings, Brazoria	1934	128,943,943
Spindletop, Jefferson	1901	128,258,131
Hull, Liberty	1918	102,448,448
Tom O'Connor, Refugio	1934	100,856,015
Thompsons, Fort Bend	1931	100,582,710
Total		922,304,466

*All in Texas.

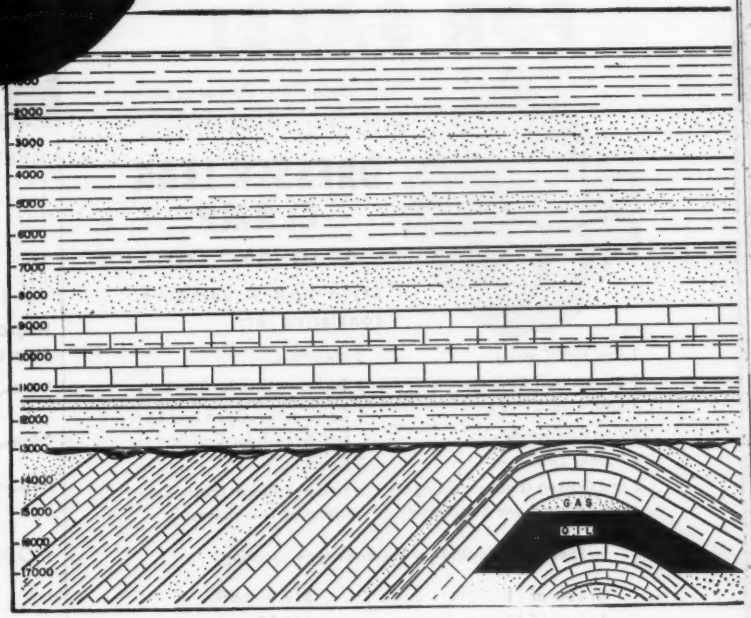
Eleven additional fields have produced from 50,000,000 bbl. up to 100,000,000 bbl. each; 22 others from 25,000,000 to 50,000,000 bbl. each, and 8 from 20,000,000 to 25,000,000 bbl. each. Currently, three fields are producing in excess of 50,000 bbl. daily each, including Conroe, Montgomery County, 55,355 bbl.; Hastings, Brazoria County, 53,020 bbl.; and Friendswood (Webster), Harris County, 52,255 bbl. Four others are producing from 25,000 to 50,000 bbl. each, and eight others in excess of 10,000 bbl. up to 25,000 bbl. each.

Top: Typical deep-drilling operation in a swamp area of coastal Louisiana. Above: Completed well in one of Louisiana's open-water-located fields showing guard for protection during storms

Of the district's accumulated production, 3,159,684,000 bbl. has come from the 662 fields of the Texas coastal area alone, and 1,163,693,000 bbl. from the 207 fields of coastal Louisiana. The Texas Coast is further divided into two general areas. The



EXPLORING DEEPER HORIZONS..



TODAY, General Crews are shooting well ahead of present deep production to locate tomorrow's reserves. With equipment specifically designed for deeper exploration, these experienced crews are now compiling accurate data on prospective producing formations as deep as there are reflecting horizons . . . to the deepest sedimentary beds.

For those operators who are looking forward to deeper drilling as their next frontier, this accurate data on the deepest sedimentary beds . . thoroughly compiled and correctly interpreted . . . will lead the way to tomorrow's deeper production.

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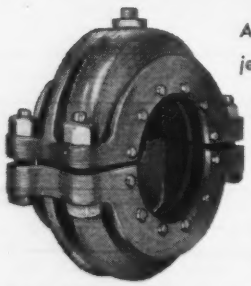

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Upper Gulf Coast comprises the southeastern and central coastal counties of the state and represents largely the original salt-dome region. The Lower Gulf Coast comprises coastal counties extending to the Mexican border. The former has 254 fields with an accumulated production of more than 2,064,733,000 bbl., and the latter 408 fields with a total of 1,094,950,000 bbl.

Current production and fields represent a total of approximately 23,800 wells, of which 20,142 are on the Texas coast and 3,772 in South Louisiana. Of the Texas coastal wells 8,111 are in the Upper, and 12,031 in the Lower district.

Although discoveries of new petroleum reserves have experienced a recession during recent years and have not kept pace with the greatly increased demands for oil which have arisen during and since the war, potentialities for additional exploration and development are considered far from exhaustion. It is true that in the widespread and intensive exploration which has been going on in this district over a period of many years, comparatively few areas and prospects, even those of questionable merit, have been left untested, so far as present concepts of depths and accessibility are concerned. However, within the realm of deeper drilling, extension of exploration out into the Gulf of Mexico along the Continental shelf, and further exploitation of possible new sands and areas in and around existing fields, particularly the shallow, piercement-type salt domes, it is more than probable that substantially important additional reserves will be found.

Slower Discovery Rate Probable

Since most of the prospects which have been indicated by existing means of detection already have been tested, any remaining undiscovered fields within the present scope of exploration necessarily will become increasingly difficult to find. At the same time the problems and costs involved in deeper drilling and operating in the open waters of the Gulf of Mexico impose certain restrictions on the extent and speed with which exploration in these directions can be carried on. Consequently, it is probable that the discovery of new fields in the future will be at a much slower rate than heretofore has been possible.

Active exploration on the Gulf Coast has continued almost without interruption since 1930, when geophysics, introduced only a few years previously, began to come into extensive use. Prior to that year only 89 fields had been found in the entire coastal region, mostly on the Texas side of the line. Since then the number of new fields discovered each year has increased steadily each year, except during 1939, until 1946, reaching a peak in 1945 when 88 fields were opened. Although the rate of discoveries dropped sharply in 1946, and again so far this year, it is interesting to note that of the total of 869 fields on the coast, 299, or more than a third, have been found since 1942, the first war year. This was despite the intensive and thorough drilling play which the coastal district had undergone prior to that year, and reflects the renewed and concentrated efforts made by operators to uncover additional reserves to meet the war emergency.

Nine new fields have been discovered in the first 4 months of this year. Six of these have been on the Texas coast and three in South Louisiana. With several wildcat tests showing for production, and with exploratory efforts of various companies expected to be intensified during the remaining months, it is probable that this number of discoveries will be greatly increased before the end of the year.

New fields discovered by years on the Gulf Coast are shown in Table 1.

Although the acute scarcity of pipe for casing has forced the shutdown of many rigs and a curtailment of operations in various areas, 510 drilling operations were reported under way on May 1, an increase of 34 over April 1, 106 over January 1, and 184 over the same period a year ago. Substantial increases in drilling are expected if and when pipe can be obtained. To conserve on pipe and make it available for exploratory wells when needed, drilling in and around proved fields has been restricted largely to lease-obligated wells and necessary offsets, although in numerous instances the drilling of exploratory wells has had to be held up or delayed because of inability to obtain pipe. Following is a comparison of drilling activity by months for 1947:

TABLE 1—GULF COAST FIELD DISCOVERIES BY YEARS

Year	Upper Texas coast	Lower Texas coast	Total Texas coast	Louisiana coast	Total coast
1947 (4 mo.)	2	4	6	3	9
1946	15	15	30	11	41
1945	28	44	72	16	88
1944	21	43	64	13	77
1943	16	33	49	17	66
1942	18	26	44	12	56
1941	16	23	39	13	52
1940	18	30	48	15	63
1939	16	26	42	14	56
1938	13	29	42	21	63
1937	18	24	42	16	58
1936	22	14	36	6	42
1935	10	22	32	7	39
1934	8	12	20	5	25
1933	4	10	14	0	14
1932	7	6	13	2	15
1931	3	3	6	5	11
1930	2	3	5	1	6
Before 1930	18	41	59	30	89
Total	254	408	662	207	869

TABLE 2—GULF COAST COMPLETIONS BY MONTHS FOR 1947

Month—	Texas Coast Total	Texas Coast Prod.	Texas Coast Dry	Louisiana Coast Total	Louisiana Coast Prod.	Louisiana Coast Dry	Total Gulf Coast Total	Total Gulf Coast Prod.	Total Gulf Coast Dry
January	180	129	51	42	26	16	222	155	67
February	187	128	59	52	39	13	239	167	72
March	310	208	102	45	31	14	355	239	116
April	237	154	83	50	39	11	287	193	94
Total	914	619	295	189	135	54	1,103	754	349
Total last 4 mo. 1946	757	480	277	199	129	70	956	609	347
Total first 4 mo. 1946	756	508	248	197	133	64	953	641	312

GULF COAST DRILLING OPERATIONS FOR 1947

Date—	Texas Gulf coast	Louisiana Gulf coast	Total Gulf coast
May 1	397	113	510
April 1	347	119	466
March 1	354	128	482
February 1	305	125	430
January 1	276	128	404
May 1 (1946)	230	96	326

Drilling is distributed widely over the entire district as indicated by the fact that the 510 active operations, as of May 1, represented more than 300 different fields and prospects, 105 in South Louisiana, more than 110 in the Lower Texas Coast, and 85 in the Upper Texas Coast. The greatest concentration of drilling in the Lower Texas Coast is in the Agua Dulce-Stratton-Seeligson - Tigerina - Canales group of fields extending across Nueces County on the north, through Jim Wells and Kleberg counties, and into Brooks County on the south. From 20 to 25 rigs are running around these fields, which now constitute virtually one large producing area. However, in view of the extent of development, more than 40 miles long and from 5 to 7 miles across, there is no concentration of rigs at any place.

Reflecting trends in exploration, completions during the first 4 months of 1947 showed a substantial increase over those of the preceding 4 months and also over those for the same period during 1946. The gain, however, was entirely on the Texas coast since a slight decline was reported in Coastal Louisiana. A summary of completions for the district for the first 4 months of 1947 is given in Table 2.

Millard Westfall, junior engineer, Cities Service Oil Co., has been assigned to the oil-production division, Bartlesville, Okla. Other new assignments to the production division in Bartlesville include **Jack Steeper,** formerly at Odessa, Tex., and **Clinton Fuhrmann,** junior engineer.

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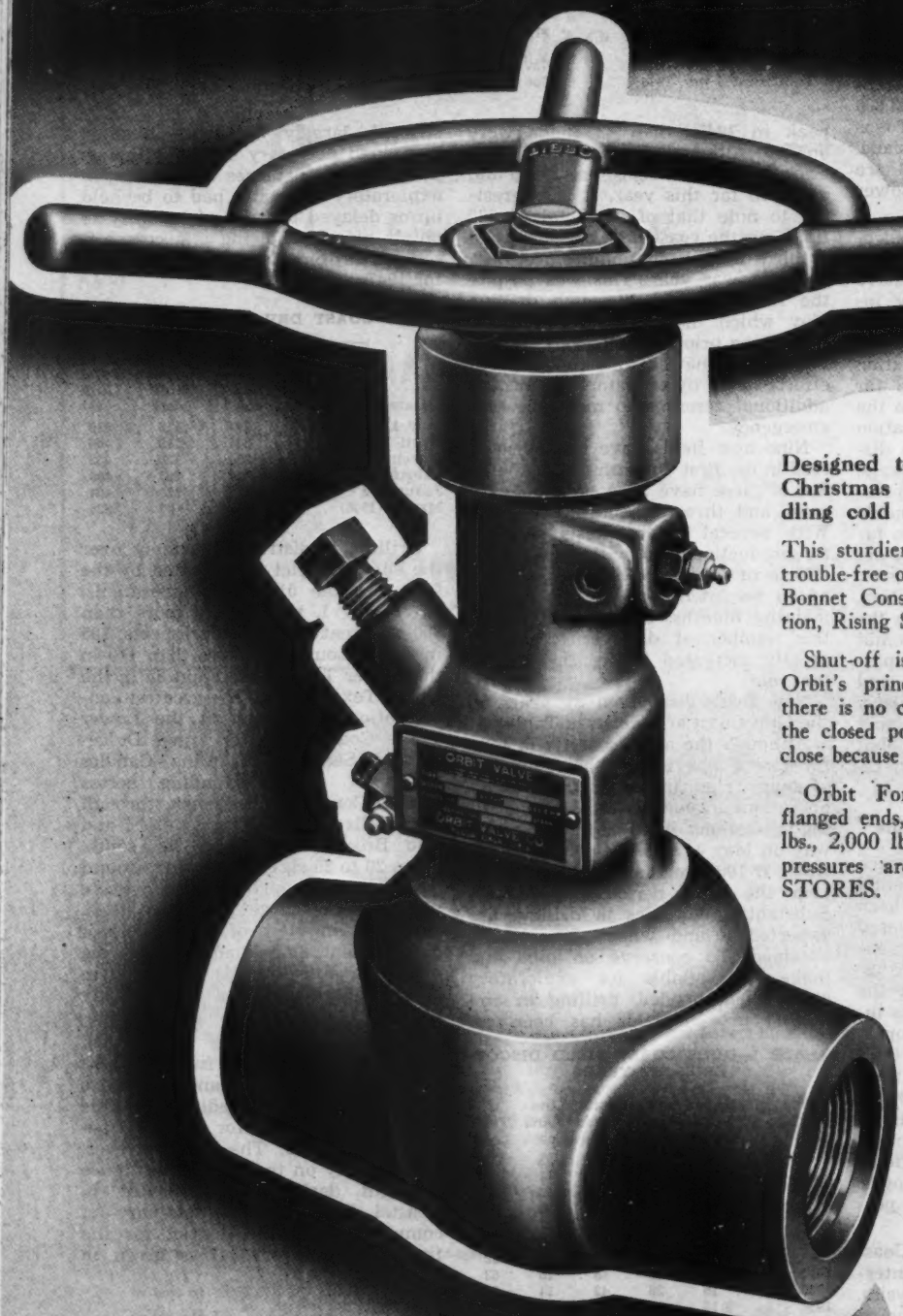

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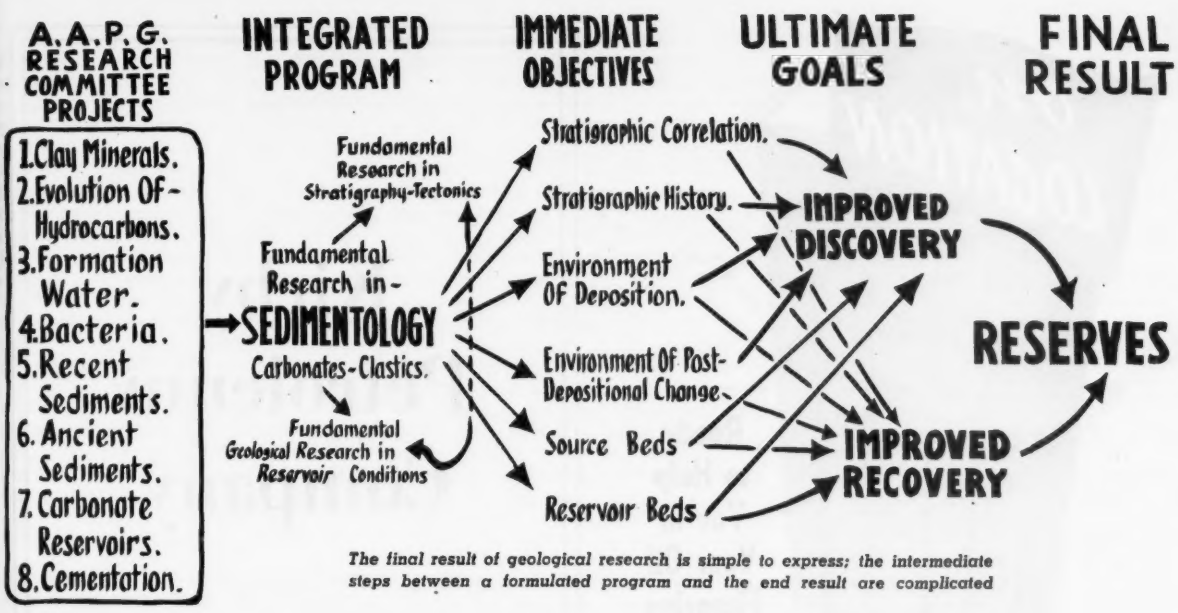


The final result of geological research is simple to express; the intermediate steps between a formulated program and the end result are complicated

Gulf Coast Figures Prominently in A. A. P. G. Research Program

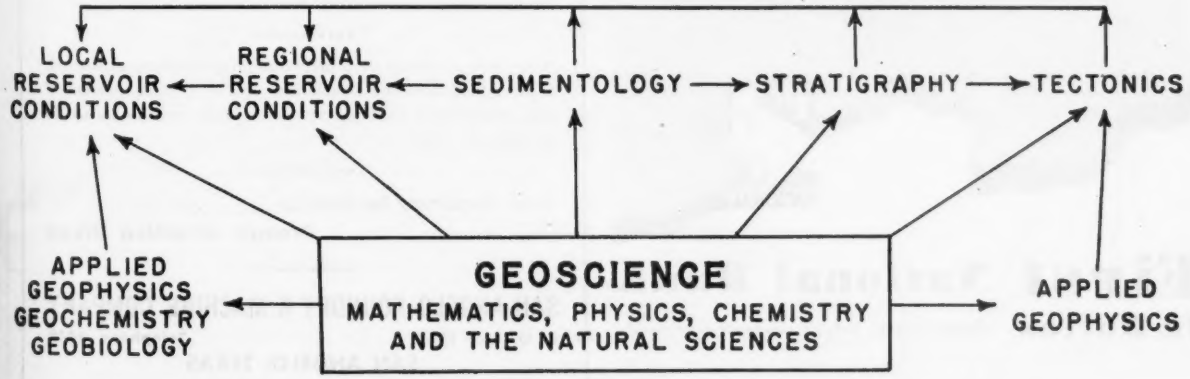
by Shepard W. Lowman*

SCIENTIFIC research today continues to get a popular vote of confidence. This popularity is useful in getting support for research, but it carries with it the obligation of doing those things which offer the best prospect of justifying this confidence.

The American Association of Petroleum Geologists' research program recognizes this obligation. The present formalized program is the result of work that started as far back as 1923, when the research committee was first organized. It is a program that has grown from the bottom upward; and it represents the conclusions of the membership as a whole, as to what gaps in professional knowledge should be filled in. The foundation of the present program was built slowly, but the result is that today we have a plan of action that has the official approval of the association.

What kind of a research program have these members gone on record as supporting? It is a broad program of fundamental research in sedimentology. They want this conducted as an integrated physical, chemical, and biological investigation of the processes and products of sedimentary deposition and postdepositional changes. They want it directed at isolating and expressing the numerous variables in sedimentary rocks and their contained fluids. The objective is to discover relationships among these that are significant and important in oil discovery and production.

*Chairman, A.A.P.G. Research Committee.



The many branches of science involved in the research program, and their interrelationships are illustrated above

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Fundamental research, no less than applied research, must be directed toward an objective. In the A.A.P.G. program, the objectives are the discovery of new methods and techniques that can be used: (1) in the recognition of petroleum accumulation provinces, and producing trends within those provinces; (2) in scientific location of "stratigraphic trap" types of fields; and (3) to increase the percentage of recoverable oil in fields that are found. Another objective is to reduce finding and production costs, by improving our present techniques and methods.

Such an investigation will be conducted as a broad program, either by one agency, or as a group of specific projects in which the integration will be supplied by the research committee of the A.A.P.G. It is to be a coordinated attack on a wide front of many salients.

Provinces of Oil Accumulation—Stratigraphic Traps—Percentage of Recoverable Oil

Oil fields are found in bunches, that for our purposes, may be divided into two classes. There are geographical bunches in provinces and producing trends. Then there are technological bunches, in that various methods and techniques are successful in finding groups of certain kinds of fields.

Most sedimentary basins either contain many oil fields, or none. Some producing basins are large and contain rich accumulations, while others are small and contain lean accumulations. Then there are various combinations of these within producing basins. Obviously there are cause-and-effect relationships among the kinds of sediments present and the degree of productivity in the various basins. But we do not know, today, except in the most general terms, what those relationships are.

The technological bunching occurs when some particular method finds a new field of substantial size. The method is then applied to other areas where the same general conditions appear likely. The Golden Lane of Mexico resulted from successful drilling in the neighborhood of seeps. The anticlinal theory brought successive waves of new fields through field mapping, core drilling, and various geophysical methods.

In looking for new methods to find oil fields, the most obvious need is a means of finding stratigraphic trap types. To date, most of these have been found by random wildcatting. Yet some of the richest accumulations of oil are in these fields. The needs of the geologist in looking for these are similar to his needs in looking for new petroleum provinces, namely, a greatly increased understanding of the characteristics of the sediments and their contained fluids, plus the geometry of their stratigraphic arrangement.

The needs of engineering geology are also very much the same. Engineers who apply measurements, based on the few known rock quantities, find the value of their results limited by the "L" factor. This is the basket term for the mass of unknown sedimentary variables and their effect on properties and distributional patterns of rocks and rock fluids. The discovery and evaluation of some of these unknowns will lead to the development of new techniques that will increase the percentage of recoverable oil in known reservoirs.

In addition to the problems connected with the discovery of new groups of fields, or new percentages of recoverable oil, geologists are also concerned with the discovery or extension of single reservoirs and the improvements of some aspects of exploration and production technology. An increased ability to evaluate the significance of rock and rock fluid characteristics in routine operations will be the principal byproduct of this program.

There are four main divisions of this program:

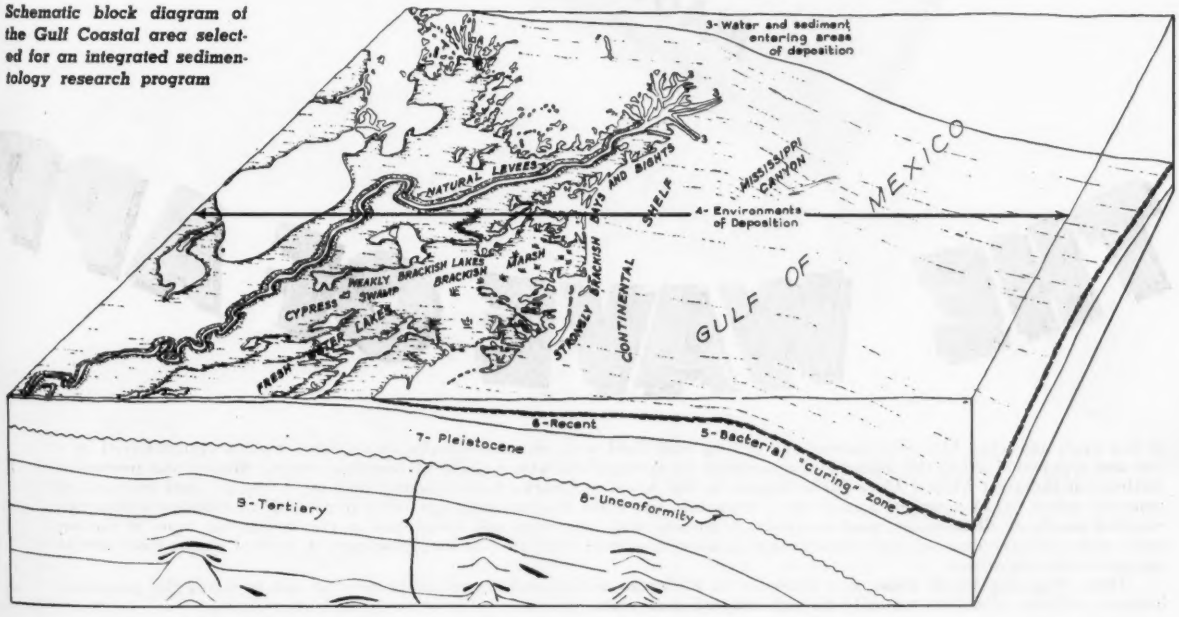
1. Recent and near recent clastic sediments of the northwestern Gulf of Mexico and Gulf Coast.
2. Recent and near recent carbonate sediments of the northeastern Gulf of Mexico, Florida, and the Bahamas.
3. Older clastic rocks—in an area yet to be selected.
4. Older carbonate rocks of Fullerton field, Andrews County, Texas.

Gulf of Mexico as Research Laboratory

The selection of the area or areas that are most suitable for recent sediment investigations is guided by the following limiting conditions:

1. Recent sedimentary patterns should be closely similar to those which are known to occur in at least one major oil province. There should also be a wide range of sedimentary patterns, and these should be representative in general of many oil provinces.
2. The recent sedimentary basin preferably should be a geological continuation of the major oil-producing basin it most closely resembles in the distribution of its sediments.
3. The region easily should be accessible to investigations, and there should be one or more scientific institutions located in the area.

The northwestern Gulf of Mexico-Gulf Coast region fulfills all of these



Schematic block diagram of the Gulf Coastal area selected for an integrated sedimentology research program

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conditions. In addition it has several other features which make it suitable as an area in which to investigate post-depositional changes in near recent sediments.

There is little regional structural disturbance in the area except for baseward tilting. The combined Recent and Pleistocene are fairly thick at the seaward edge of the delta (approximately 3,500 ft. of marine beds) and thin gradually in a landward direction to 80 ft. of river-terrace sand and gravel. Although the area is economically active in the search for oil, the Recent and Pleistocene are non-oil-bearing parts of the geological section, hence samples and other data will probably be made freely available by operating oil companies.

The base of the Pleistocene rests with sharp biolithic discordance on the continental Tertiary underneath, and is therefore a fairly well-defined stratigraphic entity, at least in its down dip (marine) expression.

What Will Be Done in the Northwestern Gulf Area?

An investigation of sedimentology properly begins with the source area of the sediments and proceeds through transportation, deposition and post-depositional change, as indicated in the following sequence:

1. Source of sediments. Composition of rock in the source area; climate during weathering, relative initial height, and subsequent uplift of source area.

2. Transportation. Transporting medium; efficiency of stream in carrying available load; physical and chemical effect on transported material.

3. Volume and composition of water and sediment entering area of deposition. Items 1 and 2 are not included in the research committee program because the results of both are considered in this item.

4. Environments of transportation-deposition; turbulence, depth, temperature, and chemical composition of water; abundance and kind of plants and animals living in continental or marine areas of deposition. In shallow-water areas where the surface of the bottom mud can be brought under direct observation, there is found to be a thin film or "skin" about ½ in. thick, lying just at surface of the mud. This is composed largely of microscopic plants and animals. The biochemical activity in this film must be intense and probably determines the principal character of some types of sediments.

5. The bacterial "curing" zone. The upper few inches of sediments deposited in water are apt to contain millions of bacteria per gram of watery mud. This thin layer is probably effective as a curing zone where the raw sediment is turned into incipient rock.

6. Recent (post-ice age) sediments ranging up to several hundred feet thick in the Gulf Coast area, and Pleistocene (ice age) sediments, ranging up to 3,000 ft. thick on the Gulf Coast. Bacteria are present and probably functionally active well below the upper curing zone of the Recent. However, other agencies are active also and with increasing depth there is increased overburden with consequent increased compaction, particularly in the clay. Porosity is decreased and formation water moves. The temperature gradient becomes effective and hydrothermal processes probably take up the role of principal agents of post-depositional change before bacterial activity ceases.

7. Unconformity between the Pleistocene and the Tertiary; structural conformity but sedimentary break with Marine Pleistocene resting on continental beds of late Tertiary age. The length of time elapsed during the indicated hiatus (break in sequence) cannot be estimated from present date.

8. Oil-producing rocks; Tertiary and older. The intensity of hydrothermal processes of post-depositional change, doubtless continues to increase with depth, to and below the base of the Pleistocene, but in the older strata something else happens.

Unsolved Problem

Oil accumulates in traps. So far as we know, indigenous accumulations of oil have not been demonstrated in the Pleistocene. The problems connected with the oil formation, migration, and accumulation, as well as many other properties and behaviors of older rocks will probably remain unsolved until we trace the sedimentary patterns from their origins and learn to distinguish between the products of deposition and those of post-depositional change.

Items 3, 4, 5, 6, and 7 are the components of a single investigation. Similar procedures are outlined for all five items; namely, (a) the collection and (b) investigation of significant materials, (c) evaluation of resulting data to bring out relationships, (d) formulation of working hypotheses, (e) which should be tested where possible by experimentation, and where (f) new kinds of materials or (g) new properties are suspected, (h) new technique should be devised, (i) to collect, (j) measure, (k) evaluate and (l) experimentally test them.

Item 8. At all stages in this work, relationships will be looked for that are significant to the interpretation of oil-bearing Tertiary (and older) rocks.

In this area, as in the other three areas included in the whole program, the work is planned and designed to discover preliminary approximations by rapid reconnaissance through the whole broad front of sedimentology. Nothing less than such a broad attack reasonably can be expected to produce results that are proportionate to our needs.

DRILLING DIFFICULTIES encountered in Olive field development

by T. H. Sandoz*

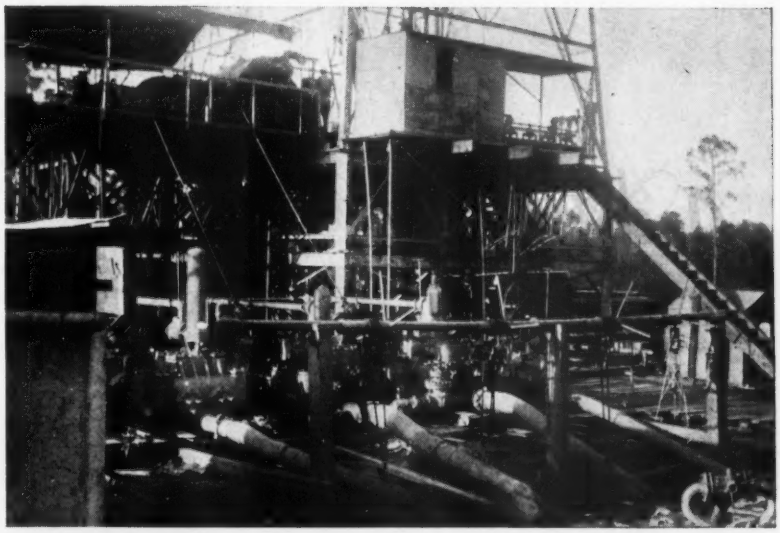
PAN AMERICAN PRODUCTION CO.'s Olive field, located in the east central part of Hardin County, Texas, was discovered and drilled as a result of seismograph operations which indicated a deep-seated structure.

The first location was staked and after being drilled it substantiated very closely the seismograph work as did all subsequent wells drilled, which confirmed an anticlinal reservoir cut by a major fault.

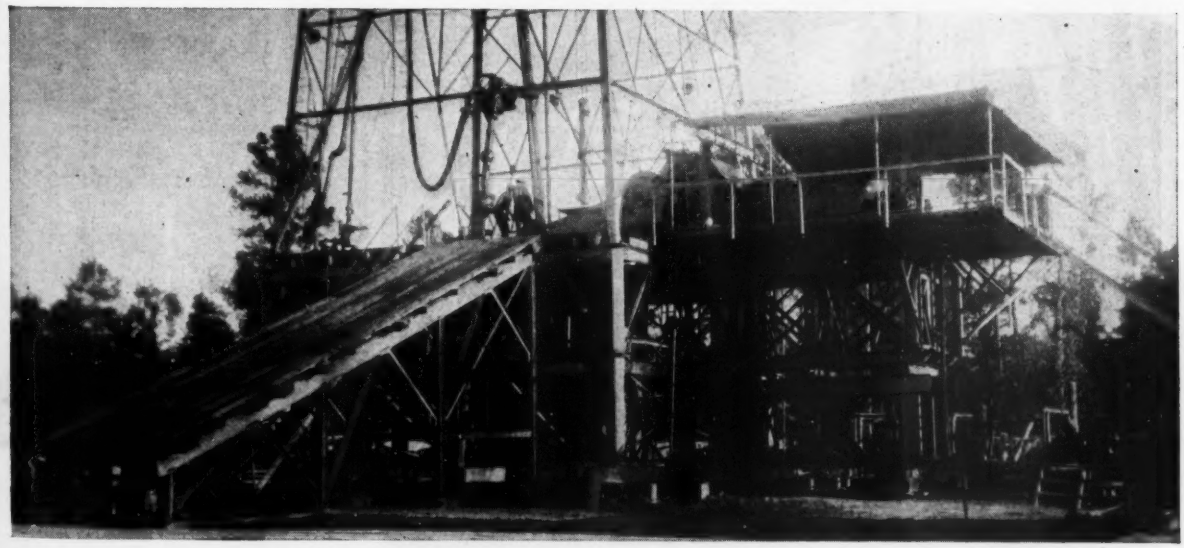
This field is located in a densely wooded area and due to the nature of the terrain and the location of the drilling site for the first well, it was necessary to construct approximately 3½ miles of board road before drilling operations could be commenced.

The operations on 1 Sternenberg, the discovery well, were commenced on May 13, 1945. On this well approximately 2,165 ft. of 10¾-in. surface pipe was set and drilling progressed with no unusual trouble to a

*Chief petroleum engineer, Pan American Production Co.



Shown here are two views of the substructure of one of the deep drilling rigs used in the development of Olive field. In the foreground of the picture is shown the mud-pump hookup used. The unusually high substructure is seen in the over-all view below



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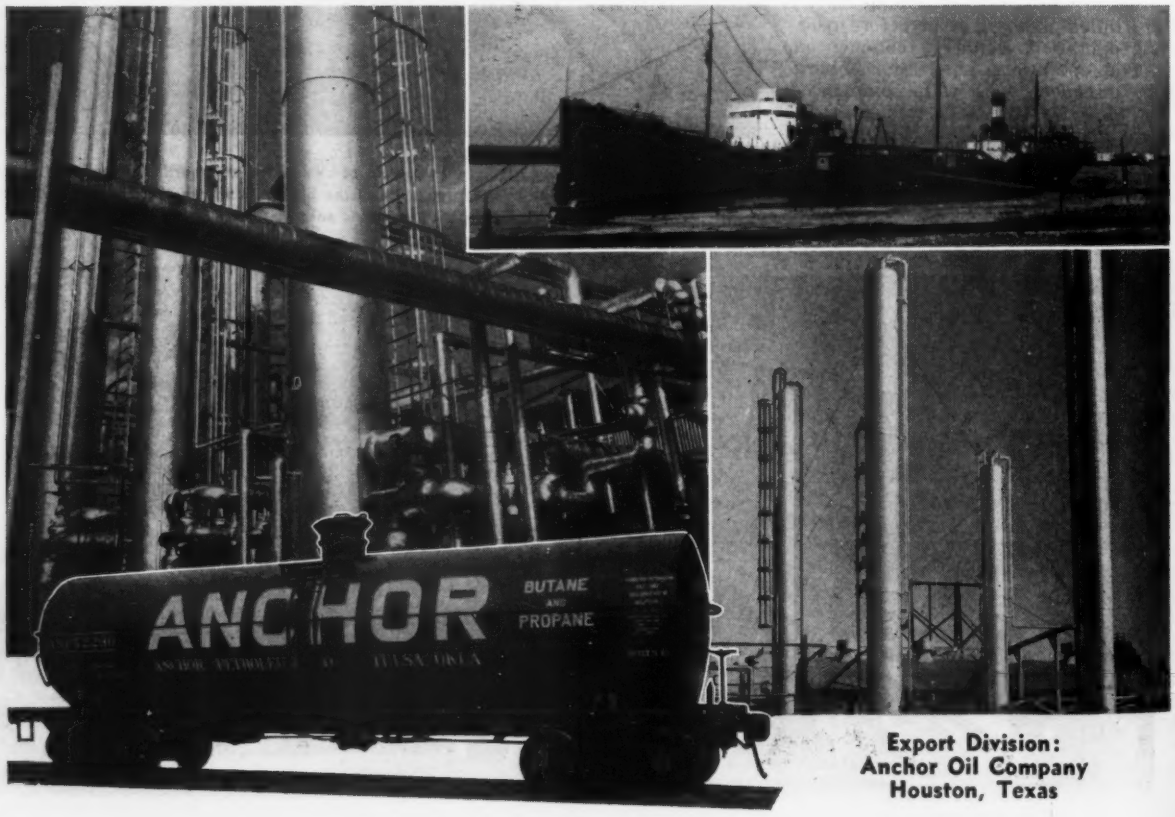

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depth of 10,017 ft. when the well attempted to blow out. At this time 11-lb.-per-gal. mud was being used and the blowout preventers were closed but the well partially unloaded the drilling mud and blew gas with a light spray of oil through a bleed-off choke line for approximately 30 hours while attempts were being made to control it by pumping 12 to 16 lb. per gal. mud into it. During these operations partial mud returns were lost and never fully regained which resulted in the drill stem becoming stuck. After 45 days of fishing for the stuck drill stem, the hole was sidetracked at a depth of 6,112 ft. and redrilled thence to 9,954 ft.

During the drilling of the sidetrack hole the mud weight was progressively increased until 13.5-lb.-per-gal. mud was being used which was the maximum weight which could be used without losing circulation. When this depth was reached it was decided to run 7-in. casing so that a higher mud weight could be carried thus permitting penetration of the high-pressure zone with the least possible hazard. Additional high-pressure blowout preventers were installed and drilling and coring resumed with 14.1-lb.-per-gal. mud with the section from 9,966 ft. to the total depth of 10,049 ft. being cored and electrically logged. A drill-stem test was taken with the packer set in the 7-in. casing at 9,934 ft. A 3/16-in. bottom choke and 4,000 ft. of water cushion was used and the well was flowing oil and gas through a ¼-in. top choke in 36 minutes after opening the tool. Maximum surface pressure was recorded at 3,500 lb. after which the tool was closed and the test bled off.

Well Started Kicking

After the drill-stem test was completed, the well started kicking, necessitating mud-conditioning operations. After experiencing considerable difficulty with lost returns and after adding considerable amounts of micatex, Jelflake, and other materials to aid in remedying lost circulation, the hole was filled with 14.9-lb.-per-gal. mud at which time the well appeared dead; however, after starting out of the hole with the testing tool, the well again started kicking. The tool was run back to bottom and mud-conditioning operations were resumed, which required 8 days, before the hole could be quieted and filled with 15-lb. mud and the testing tool removed. Tubing was then run with a production packer and the well was completed by swabbing mud from the tubing through the christmas tree.

Observations and experiences on the first well reflected the presence of abnormally high pressures in the producing horizons and also the presence of probable bedding planes near the immediate top of the producing horizon (Wilcox) in which mud returns

(Continued on page 182)

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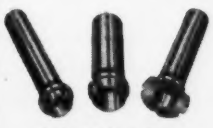

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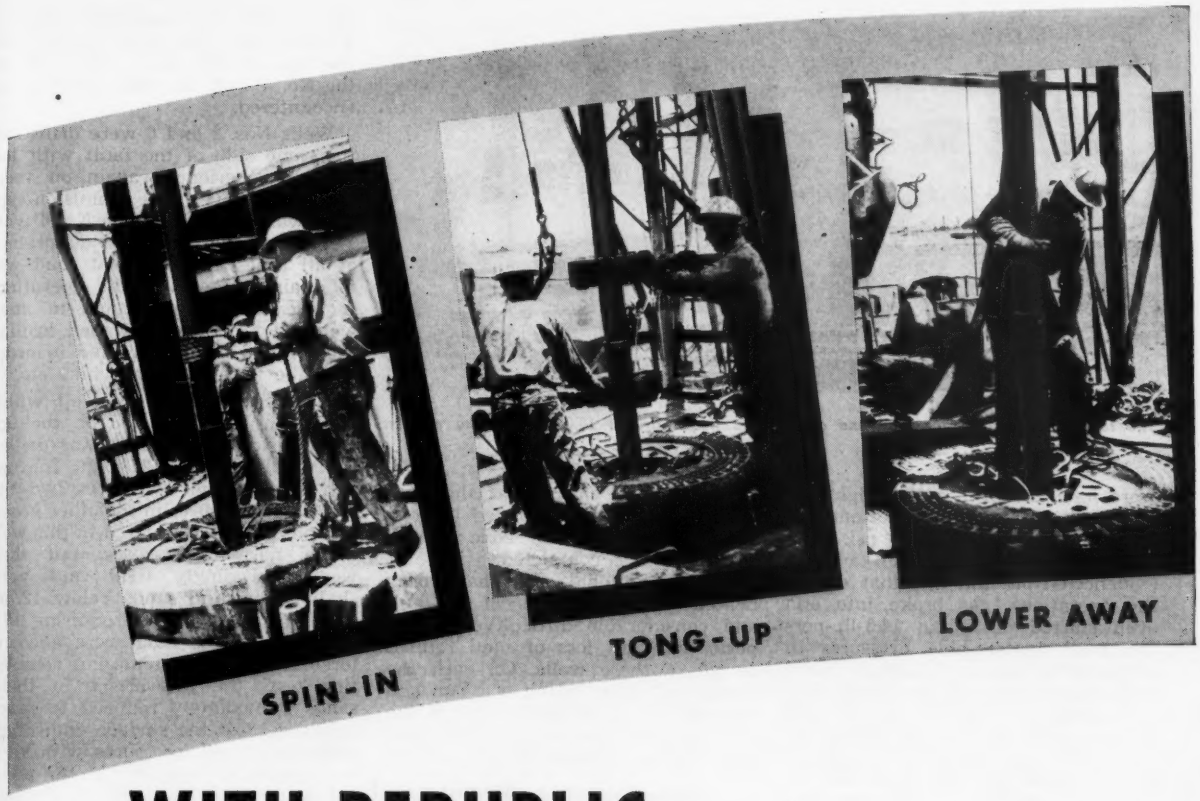

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Hoist—stab—spin-in—tong-up—lower away!
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Over and over again these operations are repeated in every hole—131 times for each casing mile.
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● Working with casing that's right for the job, your crew can develop a steady rhythm of progress to bottom . . . a time-saving, effort-saving rhythm that gets the job done well—and quickly. But they need straight, true lengths for easy handling—uniform roundness for quick stabbing—clean, accurate threads for fast spin-in and tong-up. In just six words, they need Republic Electric Weld Casing.

Because it is uniformly round, uniformly straight, and uniformly strong over every square inch, you can trust this modern casing to give full protection in the hole, as well as fast make-up of strings. Cost-wise oil country men have learned it pays to specify Republic Electric Weld Casing. You will, too, when you use it.

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REPUBLIC *Electric Weld* **NORMALIZED CASING AND TUBING**

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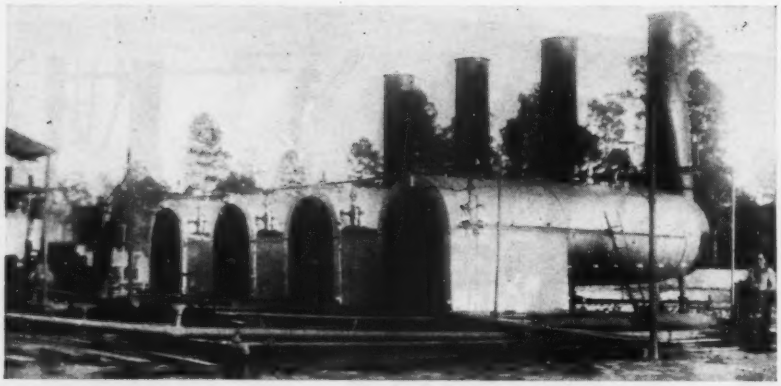

The four steam boilers used on one of the rigs which drilled 10,000 ft. to the pay in Olive field

were lost when the mud weight approached 14.5 lb. per gal. Bottom-hole pressures as high as 6,500 psi. were measured in the first well and, as evidenced from the fact that during the operations, gas broke into and even started unloading 14.3-lb.-per-gal. mud, bottom-hole pressures in excess of the measured 6,500 psi. were undoubtedly present. Due to the fact that partial to complete loss of mud returns were experienced when the mud weight was increased to as much as 14.5 lb. per gal. and mud with at least this weight was necessary for safe drilling operations, considerable difficulties were anticipated in future drilling and the decision was made to run and set the production casing string as close as safety would permit to the top of the producing formation before drilling-in.

Inasmuch as the No. 2 well was projected to penetrate through the abnormal pressure sands and explore for deeper producing possibilities, special drilling and pressure-control equipment was installed which afforded means for modified pressure drilling. This enabled coring and drilling operations to be carried on with a minimum mud weight in order to prevent loss of mud returns and still maintain full control of the well in the event it started kicking. Mud tanks were set up and the hole was filled with heavier mud to make trips; however, even during these periods the pipe could be pulled and run through a "stripper type" blowout preventer and by keeping a flapper-type check valve in the drilling string full well control was maintained during trips. This flapper valve was specially designed and constructed to permit passage of wire-line core barrel and retriever and wire line coring operations were carried out with safety. On well No. 2, 7-in. casing was set at 9,950 ft. and drilling and coring was carried on under this modified pressure set up to a depth of 11,474 ft. with no appreciable difficulties other than loss of returns when flushing the heavier mud from the hole after making trips. A short string of 5-in. casing was then run and the well was completed through perforations in the same zone that the No. 1 well was completed.

Three additional wells have been drilled on the same side of the fault and considerable difficulty was experienced with loss of mud returns on all of these wells. On each the producing casing string was run and cemented as close to the top of the producing horizon as was safely possible without drilling into this horizon.

Thief Formations Studied

A careful study was made as to the possible "thief" formation or formations in which the mud returns were being lost and due to the nature of the producing sands which are very tight and have a very low permeability, the possibility of mud entering them was partially obviated. These producing sands are very near the top of and in the Wilcox formation and immediately above these abnormal-pressure sands is a shale section with extremely thin sandy streaks. It was concluded that the mud returns were lost in this section probably in the horizontal bedding planes of the shale members of the section, and even though the mud was maintained in excellent condition throughout all drilling operations sufficient weight could not be carried to offset the abnormally high pressures without partial to complete loss of returns.

In an effort to overcome this situation oil-base-emulsion mud was tried and maintained in the best possible shape on the No. 3 well, after using practically all known and available materials for remedying lost circulation, and which apparently solved the problem to a considerable degree. It was decided that by using this type mud immediately upon drilling out from the protection or production string of casing the difficulty might possibly be completely overcome. This thought was based on the theory that the extremely low water loss which could be maintained by using the emulsion-type mud together with its excellent wall-building properties would reduce the water action from the mud on the shale. However, on the No. 4 well the same trouble was encountered.

Wells Nos. 4 and 6 were drilled on the same side of the fault with lost returns experienced again on these wells. However, the emulsion-type mud was not used on the No. 6 well. Very close vigilance was maintained at all times and excellent mud was maintained, however, the operations required slight reduction in mud weight for drilling and then loading the wells with heavier mud in order to make trips to change bits, etc.

The 1 Sternenberg "B" well, which is the only well located on the upthrown side of the fault, was drilled to a total depth of 12,946 ft. The upper Wilcox sands which carried the abnormal pressures in the other group of wells were encountered in this well under normal pressures, but they were exceedingly tight and very shaly. In several sands below 12,700 ft. abnormal pressures requiring 15.2 to 16-lb.-per-gal. mud were encountered. But when attempting completion tests the pressure from these sands immediately reduced to practically zero at the surface, indicating abnormally high pressures with very low producing capacity. At the present time, after completing in the upper Wilcox sand, this well will build up considerable tubing-head pressure upon being closed in for several hours and it is now producing by heads.

The drilling-mud costs for the wells in this area were very high; however, the fact that formations immediately above the producing sands, which could not be cased off before penetrating into the producing sands, limited the mud weight which could be used and resulted in difficult and tedious operations which necessitated extremely close mud control at all times and particularly after the protection or production string of pipe was set.

BOOKS

1946 BOOK OF A.S.T.M. STANDARDS. In five parts. Published by American Society of Testing Materials, 1916 Race Street, Philadelphia. 7,000 pp. $44.

With more than 1,400 standards, specifications, tests, and definitions for a wide range of material, the 1946 Book of Standards has been issued in five parts instead of the former three volumes. This book carries the A.S.T.M. specifications and tests in their latest approved form.

Division is as follows:

Part 1A—Ferrous Metals; Part 1B—Nonferrous Metals; Part 11—Nonmetallic Materials—Constructional; Part 111A—Nonmetallic Materials—Coal and Coke, Petroleum Products, Aromatic Hydrocarbons, Soaps, Waters, Textiles, Gaseous Fuels,; Part 111B—Nonmetallic Materials—Electrical Insulating Materials, Plastics, Rubber, Paper, Shipping Containers, Adhesives.

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South Texas Workovers

(Continued from page 133)

company's previous efforts as well as those of other operators in the field is in order. Some reservoirs have histories of never having a successful workover. Others show a remarkable percentage of success when special details, such as completing above or below a shale break or other impervious interval, can be followed. Still others, a minority, respond readily to squeeze cementing or other forms of fluid segregation with almost certain successful results. Representatives of the electric-logging, cementing, perforating, and tool companies often are found to be excellent sources of information as to histories of workovers.

Sometimes it is necessary to try to increase the production from a well in which the isolation of gas or water is not a particular problem. Screens may become sanded up or clogged with mud or scale. Small explosive charges are a cheap and effective means of overcoming difficulties of this nature. Table 1, well D, shows the results of this type of treatment on one well. The cost was approximately $400, including the expense of pulling and rerunning tubing.

Carbonate Scale Deposit

South Texas is generally free of paraffin troubles but some wells, particularly those on gas lift which produce large volumes of water, show a tendency to deposit a carbonate scale on the upper part of the tubing or casing and in the flow line. This deposit, if not removed, will eventually close the eductor pipe entirely. Removal is usually effected by periodi treatment with acid. Table 1, wells A, B, and C, shows typical results of carbonate scale removal from the tubing and flow line. The cost of the acid jobs was about $150 each. The tubing job cost about $240.

Production from tight or low-pressure formations often can be increased by treating the face of the formation with acid. If a well is making both water and oil, acid treatment sometimes will increase the oil production without a corresponding increase in water. However, if water or gas is being segregated from the producing formation by cement, caution should be exercised in deciding to acidize, as it seems that generally the acid will work down the pipe to admit water or up the pipe to admit gas, or both ways.

Equipment failures, by corrosion or from other causes, contribute to the number of workovers necessary, but, in general, repair work of this type is undertaken to maintain production already in sight rather than to try to effect recovery of additional oil. Some wells are pulled periodically to repair or replace corroding well

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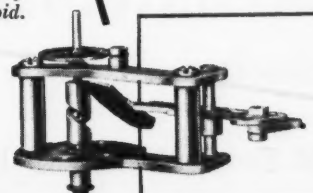
With back flange for wall mounting, or without flange for stem mounting. Safety blow-out discs optional.

Specify Helicoid gages in the new ACALOY case. They will reduce your maintenance expense. . . . the Helicoid movement, with no gear teeth to wear out, lasts many times longer.

Send for the new catalog that tells the complete story of Helicoid.



Only Helicoid pressure gages have the Helicoid movement.

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FLINT STEEL CORPORATION

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The change applies to the name only and will not affect the ownership, management, personnel, or operating policies of the company. Our friends and customers made during the past 37 years are assured of the same sound business relations and service which they have been accustomed to in the past.

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President

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BUBBLE TRAYS
BUBBLE CAPS
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DEPHLEGMATORS
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EVAPORATORS
EXTRACTORS, Mist
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FRACTIONATING COLUMNS
HEAT EXCHANGERS
HEATERS, Storage Tank
PLANTS, Natural Gasoline
PREHEATERS
REBOILERS
STABILIZERS
STACKS, Steel
STAINLESS STEEL Vessels
STEEL, Structural
TANKS, Air
TANKS, Chemical
TANKS, Pressure Storage
TANKS, Stainless Steel
TOWERS, Bubble
TOWERS, Evaporator
TOWERS, Fractionating
VESSELS, Pressure

equipment. Others are treated by injecting inhibiting compounds, and still others are electrically insulated at the flow-line connection to minimize electrolysis by stray currents. So far as is known, no practical method of providing general cathodic protection for tubular goods in a well has been evolved, but cathodic protection of tank bottoms, pipe lines, and other expensive surface equipment by use of either a sacrifice metal anode or a rectifier is becoming more common.

In some wells, corrosion in tubing has been found to be unusually severe at, or even confined to, the metal within a foot or two of the upset. This usually is attributed to grain structure changes caused by heat and compression during the formation of the upset. Use of plain end tubing, where practicable, is the best way to prevent this type of corrosion. Closer inspection of casing by internal magnifying reflectors and magnetic flux, together with more rigid mill inspection and higher hydraulic test pressures before the pipe is shipped, is expected to eliminate a source of serious and unprofitable workovers for operators. Tubing inspection by a recording internal caliper and use of plastic-coated tubing in severely corrosive wells should provide further relief from workovers occasioned by equipment failure.

Workovers in Penetrated and Cased Reservoirs

As a generality, sands that have been passed by for the initial completion of a well are not as good as that in which the original completion was effected. Usually, when there is a choice of sands for completion, the best one is tried first. Failure to protect the other zones, either due to lack of sufficient cement or a poor cement job, leaves the sand face exposed for years to the annulus mud. In extreme cases, the unprotected zones are free to dissipate their energy to lower-pressure zones or to be contaminated by water from higher-pressure water sands. Workovers to sands that have not been protected are more often than not disappointing.

Many of the older wells were cased without an electric log being run. Identification of zones in wells of this type depends upon drillers' logs and core records made when the well was drilled. Too much credence should not be placed upon old descriptions unless the person that made the description is known. For instance, what one man may describe as "sandy shale, no show" may be "tight shaly sand, gas odor" to another. Similarly, what one man may have described as "soft gray salt-water sand" may actually be a "soft gray gas sand" that had been invaded

(Continued on page 191)

YOU can depend on WHITAKER to push a job through!

During more than 27 years of pipe line experience Whitaker crews have had a part in the construction of many of the nation's important oil and gas lines.

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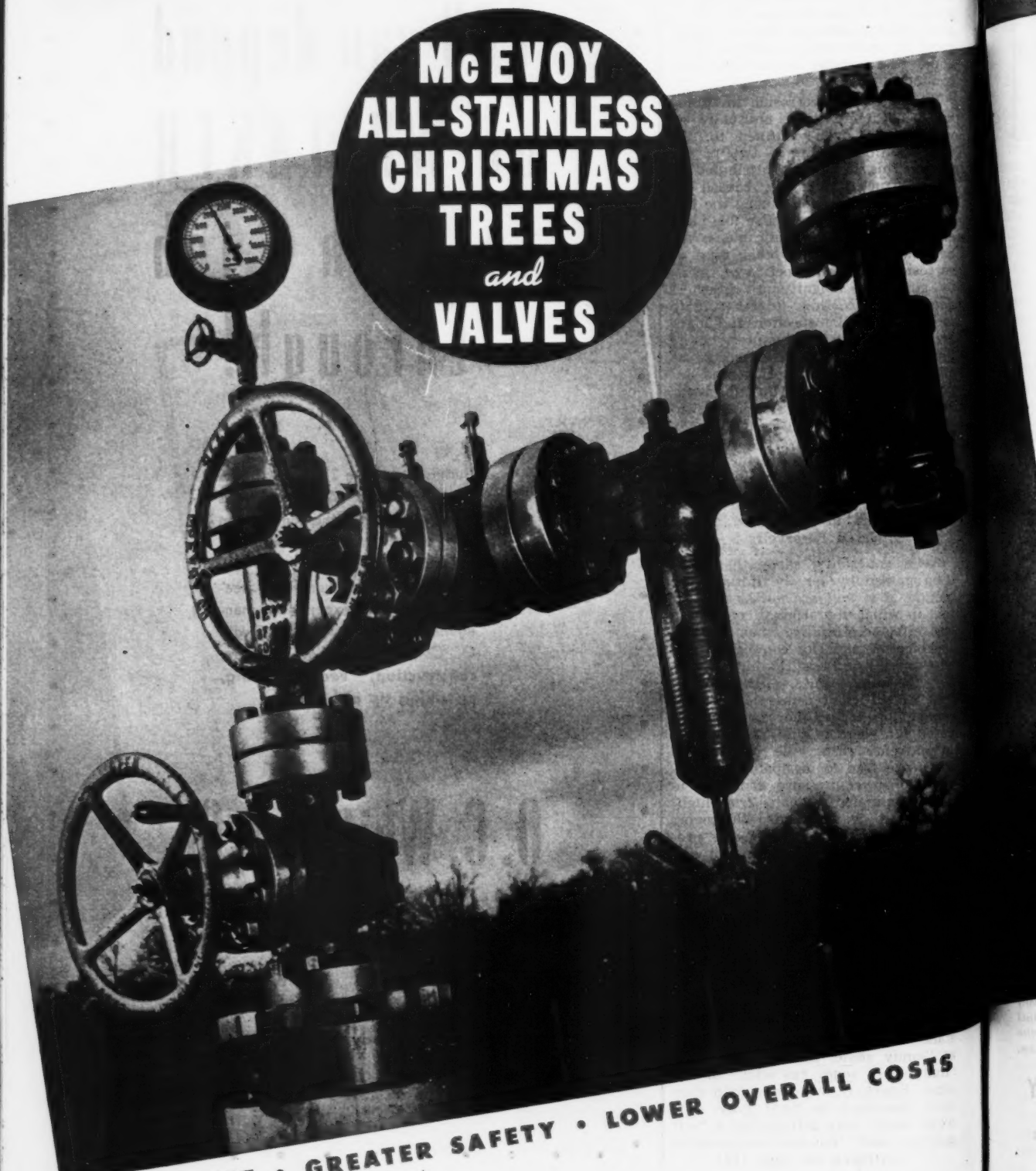

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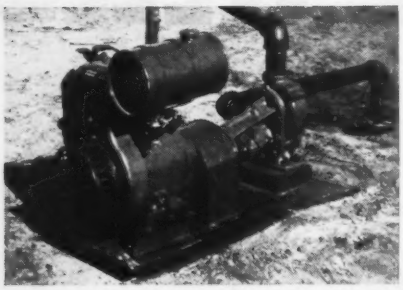

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Compressor units for engine starting, paint spraying and specialized uses. Electric lighting plants A.C. or D.C. from 1 K.W. to 5 K.W.

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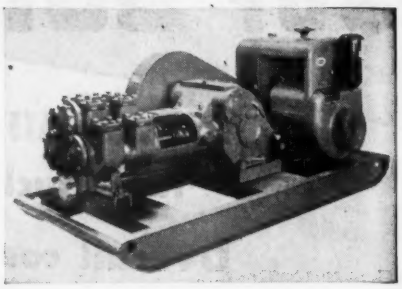

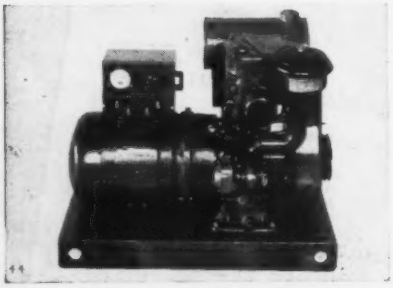

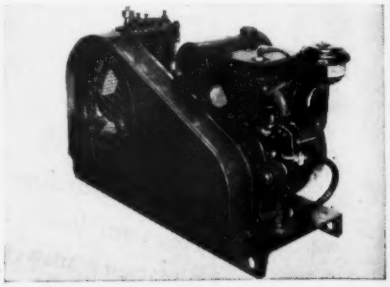

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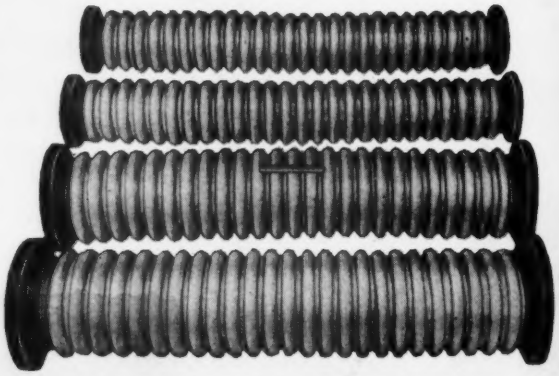
MAR-FLEX PIPE JOINTS



These flexible connectors were recently consolidated into a line to be known as MAR-FLEX Pipe Joints. Typical examples shown are stainless steel, 8", 12", and 14" pipe sizes. Eight feet long, they are operating under 250 lbs. pressure and saturated steam temperature, absorbing vibration and at least 6" misalignment and traverse. Employing four distinct methods of fabrication on these and special expansion joints such as elbow, internally insulated and steam jacketed joints, the MARQUETTE Catalog also lists special shapes as rectangular, triangular, obround, etc., for vacuum service and up to 2000 lbs. internal or external pressure. Agents in principal cities.

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by drilling water. Also, a sand considered too tight to produce a few years ago may now appear more favorable by comparison with present completion zones. Some companies now make a regular practice of running simple chloride tests on water obtained from each zone in a new well, so as to aid in the later identification of the zone, as well as to evaluate better its present fluid content.

In cases where an electric log is available, but no core or drill-stem-test data have been recorded, care should be exercised, especially in areas with which the operator is not thoroughly familiar, in attempting to judge the productive possibilities of a zone by the values shown on either the self-potential or resistivity curves. At the usual electrode spacings, in the thin sands characteristic of South Texas, the resistivity scale readings may be considerably altered by the beds on either side of the possible producing zone. For example, Fig. 3, well K, shows a portion of an electric log from a Frio sand well in San Patricio County that is highly productive, with low resistivity values; whereas, well L, a Frio sand well in another field of the same county, is unproductive, although the values are higher than in the former well. It is of interest to know that well K was drilled and abandoned as dry in 1941, and that its producing possibility was not recognized until 1946, when it was completed as an oil well.

Accurate depth measurements, both original and present, are necessary in recompleting from one zone to another. One case is known in which, some 15 years ago, the operator cored and recorded an oil sand, but failed to change the drill-pipe measurements when the drill-collar assembly was set back and the coring assembly picked up. Consequently, the sand was recorded as being some 50 ft. lower than it actually was, and the first attempt to recomplete in it was, naturally, unsuccessful. This is an extreme case, but it is cited to show that a high degree of thoroughness is necessary to evaluate the data taken several years ago. By the same token, unceasing alertness is needed to keep present pipe measurements from being in error.

Gamma-ray and neutron curves are of great value in locating cased-off sands. In some areas of South Texas, especially in the Miocene and Upper Oligocene intervals, ash in the shale sections causes erratic gamma-ray readings and renders correlation difficult if not impossible. In other areas, correlation with electric logs is excellent. In almost any well, a combination of gamma ray and neutron logs will be found to be adaptable to correlation with electric logs. These correlations, when used in conjunction with collar locators or other positive reference points, greatly narrow the limits of probable error in perforating a new zone. Accuracy of correlation is enhanced by having long sections with which to work. Since the cost of these surveys depends upon the maximum depth of recording, it is just as cheap to log a long section upward as it is to log only a short portion.

TABLE 1—RESULTS OF SCREEN SHOTS AND SCALE REMOVAL

Well No.	Prod. before work, B.P.D. Oil	Water	Prod. after work, B.P.D. Oil	Water	Remarks
A	33	621	50	662	Acidized tubing
B	33	712	44	714	Acidized tubing
C	11	740	24	1,038	Replaced scaled tubing
D	11	102	34	238	Screen shot

In attempting completion in another zone, the same geological considerations as mentioned under workovers in the same reservoir apply. As a rule, fewer data will be available upon which to base a decision, and the operator will have wider latitude, with a consequent greater chance of being wrong, in deciding

POWER WHEEL

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- ACCURATE SAMPLES
- UNLIMITED CAPACITY

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This new model is Self-Motivated, a feature pioneered by Thompson—operates entirely from the flow of mud. The Sample Machine is standard equipment, unless otherwise specified . . . Its the field-tested method of providing accurate samples of foot by foot cuttings.

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TABLE 2—COST OF DEEPENING 100-FT. THROUGH 5½-IN. PIPE

Preliminary work—	
Water and gas lines, pits, moving rig, etc.	$625.00
Service charges—	
Killing, squeeze job, drill-stem test, electric log, liner job, and perforating	1,550.00
Cement, mud, and chemicals	800.00
Rig time, 10 days at $420	4,200.00
Rental on drill pipe and special tools	300.00
Hauling	200.00
Well equipment—	
Liner, packer, guide shoe, bits, etc.	700.00
Total	$8,375.00

whether or not to attempt a recompletion.

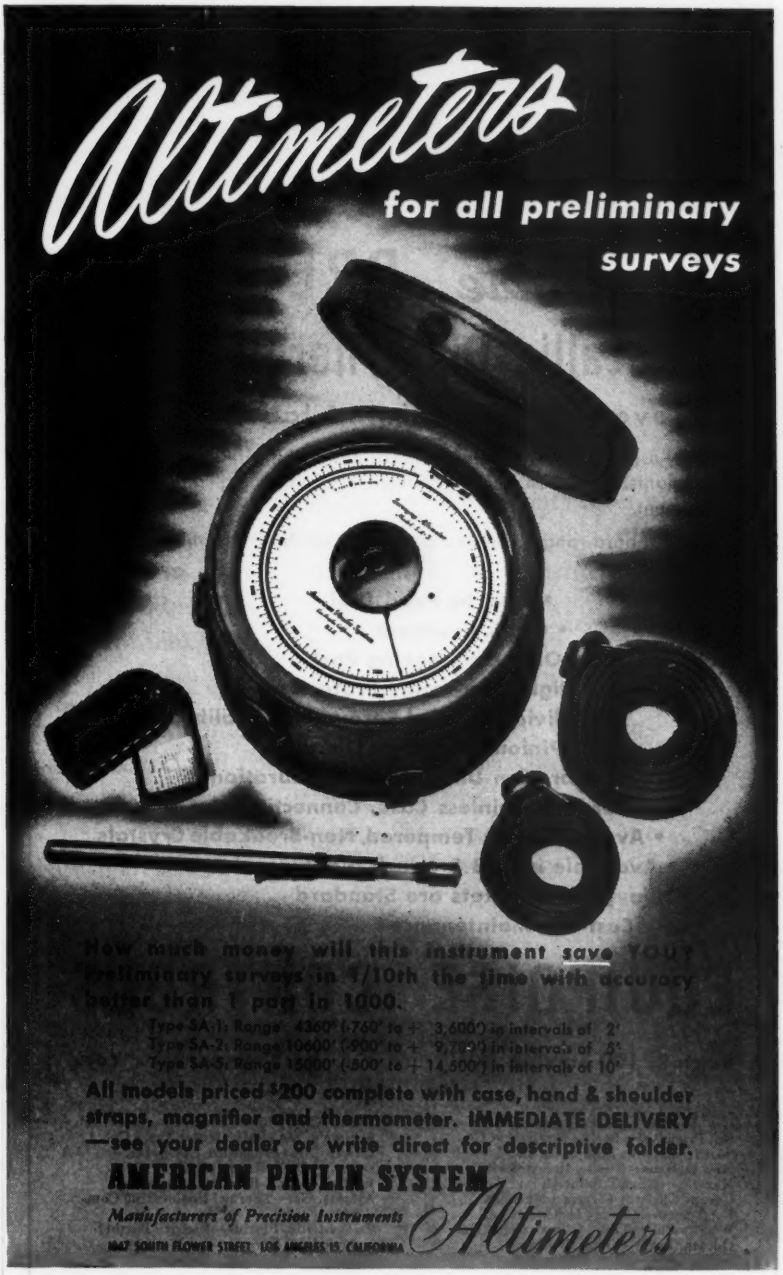
In a new field, in the hurry to complete wells and establish production, the first wells often are bottomed short of a deeper but undiscovered producing zone. Fig. 1, wells Nos. 8 and 4, shows such a case. Too, it is sometimes desirable to stop wells above the water contact of a reservoir, even if deeper productive zones are known to exist. A close study of the geology of a field will often reveal the feasibility of deepening certain wells. If 7-in. casing has been set, it may be possible to carry a well 2,000 or 3,000 ft. deeper. If 5½-in. casing has been set, deepening is usually limited to a few hundred feet. The usual completion practice in South Texas is to hang a liner well up in the original oil string, mix enough cement to fill the liner and annular space back to the hanger, displace the cement to equalization at the hanger, collapse the liner packer, then squeeze part of the cement left in the liner into the formation through the back-pressure valve in the set shoe. Table 2 details the cost of deepening a typical well through 5½-in. casing from 5,433 to 5,537 ft.

Economic Considerations

Frequently, a workover can be a mechanical success and an economic failure. The best estimate possible should be made of the anticipated cost, and some estimate should be made of the expected additional oil recovery. Some companies use printed forms for making these estimates, so that no factors are overlooked.

Consideration should be given to the value of the oil left in the zone from which it is proposed to remove the oil. Lifting costs, both present and anticipated future, should be considered. It may be found that a good flowing well is more profitable than a good pumper, even if the flowing well produces less oil. The person making the recommendation as to recompletions should know the net working interest of the company in the property. Royalty payments and overrides frequently change a plan, which, from a purely mechanical standpoint, would be attractive. Changes in allowable are an important factor. Recompletion of a well to a zone from which other wells are producing may alter the spacing pattern with a consequent reduction in allowable for all wells on the lease. Before starting to plan a workover, it is well to read again the Railroad Commission field rules on the field. Possible additional offset obligations are another factor that often have a bearing upon possible recompletions.

In order to maintain an average profit from workovers, it is necessary to play cinches insofar as possible, and to refrain from getting involved in border-line payouts. With the best of planning, some jobs are going to cost more than anticipated and some that appear perfect are not going to produce. To take care of such cases, it is necessary to limit to the minimum those jobs which have no more than a fair chance of success, and to utilize fully those jobs which appear to have a better than average chance.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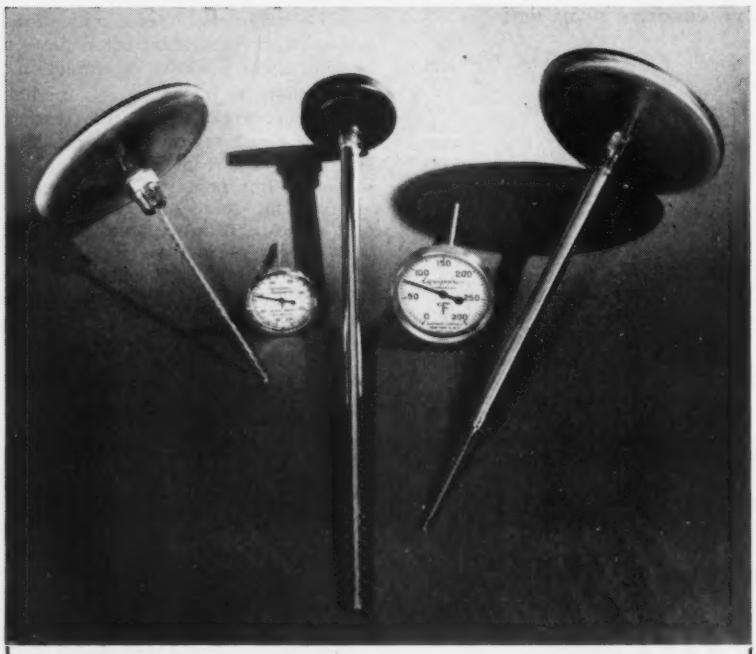

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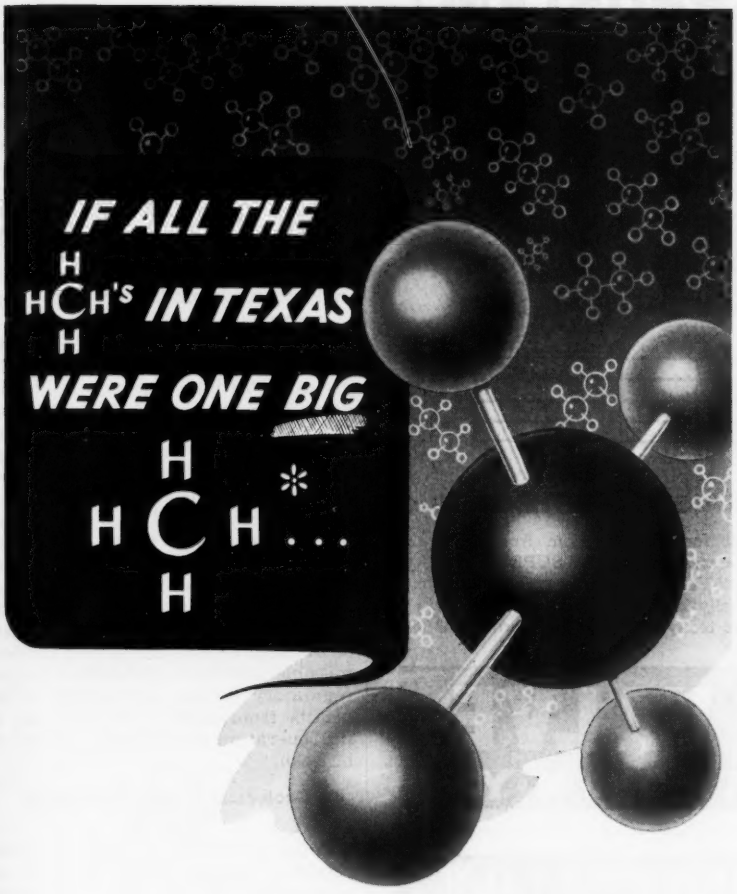
Petroleum Geology

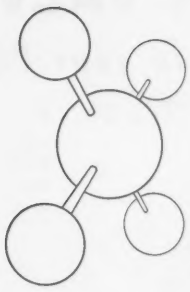
(Continued from page 141)

both on the land and on the Continental shelf. Drilling technique has undergone a remarkable change since the days of the Lucas gusher at Spindletop. Mechanical and petroleum engineering has revolutionized drilling equipment and the present efficiency in the drilling of wells can best be illustrated by the increasing depth of wells over a period of years. In 1901, the deepest well known to the world was 2,000 ft.; in 1909, the deepest well was 5,650 ft.; in 1935, the deepest well was 12,786 ft.; in 1946, the deepest well was 16,668 ft. Today, however, the world's deepest test is 17,236 ft., and some of the present drilling equipment is capable of drilling below 18,000 ft. In the near future, it is probable that a 20,000-ft. test will be drilled somewhere in the United States, probably on the Gulf Coast of Louisiana.

It is interesting to note that of the 11 new oil fields found in the Louisiana Gulf Coast in 1946, the average depth was 10,865 ft. and of the 7 new oil fields found in the Gulf Coast of Texas in 1946, the average depth was 9,558 ft. During this same period, the average depth of all dry holes drilled in the Louisiana Gulf Coast was 9,888 ft. and the average depth of all dry holes drilled in the Gulf Coast of Texas was 7,598 ft. There are relatively few wildcat or exploratory tests drilled in the Gulf Coast today to a depth of less than 10,000 ft. Despite this deeper drilling in 1946, there was an abrupt decline in the percentage of discoveries. In the Louisiana Gulf Coast, the number of productive wildcats constituted 15 per cent of the total wildcats drilled during 1946 as compared with an average of 20.9 per cent for the years 1937 to 1946 inclusive. In the Upper Gulf Coast of Texas, the number of productive wildcats constituted 8 per cent of the total wildcats drilled during 1946 as compared with an average of 12.2 per cent for the years 1937 to 1946 inclusive. These figures reveal that while the cost of drilling exploratory tests in the Gulf Coast has increased tremendously, the chances of discovering a new field have declined approximately 35 per cent as compared with the average over a 10-year period from 1937 to 1946.

The deepest production in the world now comes from Shell Oil Co., Inc.'s Weeks Island field, New Iberia Parish, Louisiana. Production in this field is from Miocene sands ranging in depth from 13,250 to 13,875 ft. (See Fig. 3.) The tremendous thicknesses of Miocene sands occurring in the Mississippi Delta area of the Louisiana Gulf Coast makes it appear very probable that many of the presently known structures in this area will be tested to depths ranging from





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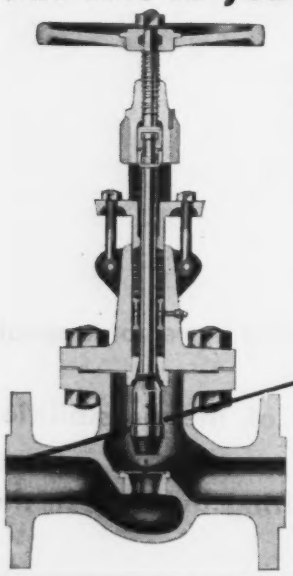

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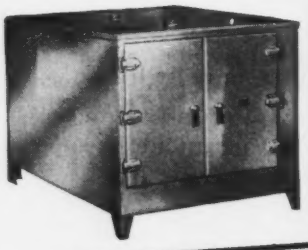

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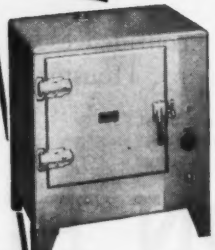

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12,000 to 20,000 ft. in an effort to find deeper production.

Geologically, this deep drilling means that more horizons are being tested by each well and that formations that have produced in the shallow trends are now being tested further downdip, and existing fields downdip along the coast will eventually be tested for deeper production. Most of the known structures of the Gulf Coast that are producing from depths above 8,000 ft. are being tested for production from deeper horizons.

Although some few deep fields have proved to be very profitable, the great majority of the deep fields discovered in the Gulf Coast in the past few years have not been of major importance and have not added materially to either the reserves of the country or to the reserves of the operating company. The proven areas of most of these fields have been small and the sands, particularly in the Wilcox fields, have been relatively thin and tight. These deep sands are under high pressure and the gas-oil ratios are generally above the permissible ratio as established by the regulatory bodies. The extent of the profits from most of these fields to the operating companies remains to be seen.

Geological Trends Now Being Explored

Some few independent operators fortunate enough to obtain leases on piercement-type salt domes are drilling the flanks of these domes in search for relatively shallow production. The known piercement-type domes are being studied in detail by independent geologists and land men in an effort to obtain enough favorably located acreage for flank tests. The total number of such exploratory tests being drilled, however, comprises a very small part of the total exploratory tests drilled in the Gulf Coast.

The most important geologic trend now being played in the Gulf Coast of Texas at present is that of the deep Frio and Hackberry. The Upper Frio trend in Jackson, Wharton, and Fort Bend counties has been tested to such an extent that there is little possibility of finding a large field in this area. Along the coast, the Frio sands tend to shale out downdip in some localities, but local depositional basins have resulted in the accumulation of unusually great sand thicknesses in some areas; this is particularly true in central Brazoria County. These deeper Frio sands offer one of the best opportunities in the Gulf Coast for the finding of fields with relatively large reserves. Five of the seven new oil fields discovered in the Texas Gulf Coast in 1946 were from Frio sands ranging in depth from 8,400 to 9,200 ft.

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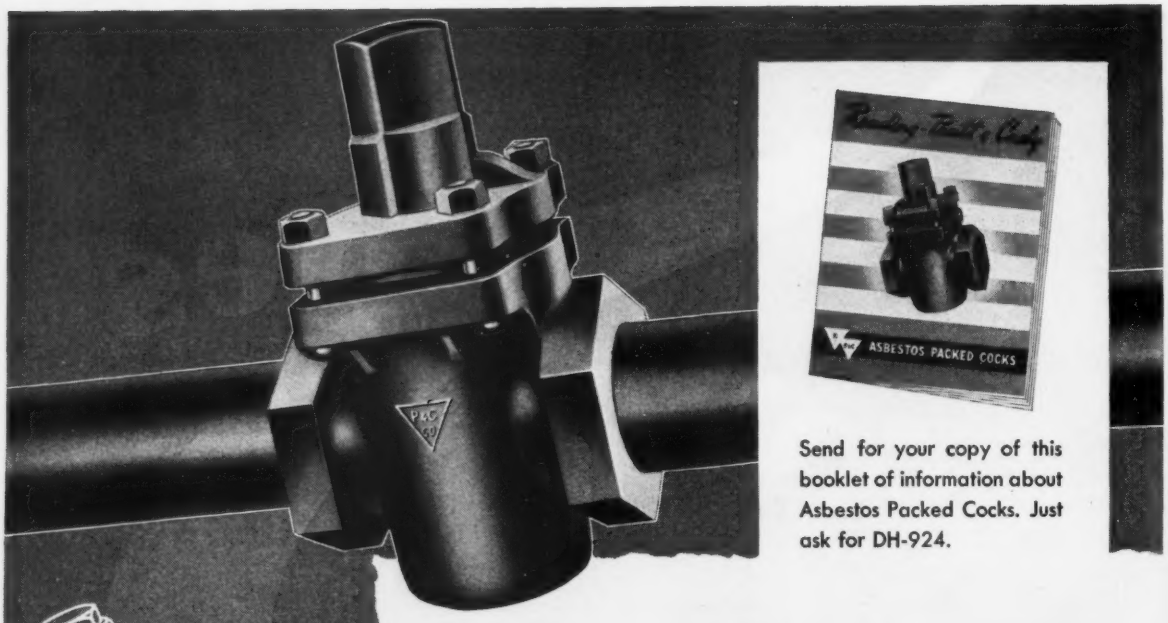

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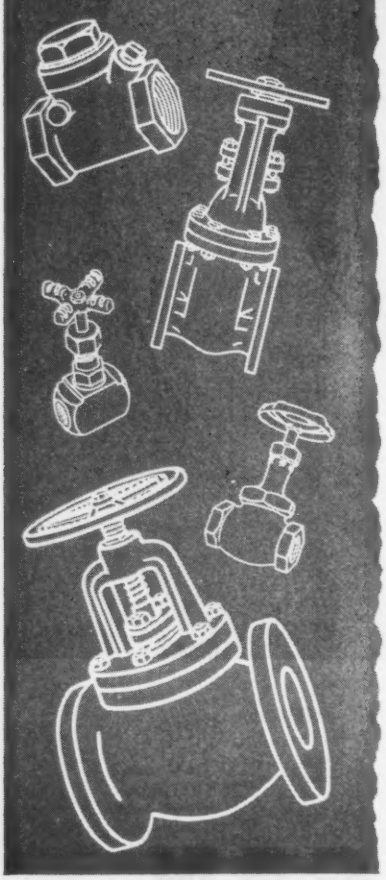

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have recently been brought into prominence in southern Orange and Jefferson counties by the extension of production on the flank of the Port Neches dome. This production, discovered in late 1946, comes from Hackberry sands at a depth of 8,600 ft. The sands are well developed in this locality. This discovery will probably result in a number of structures in this area being tested to the Hackberry sands.

The Miocene-Oligocene sands continue to receive the greatest play in the Louisiana Gulf Coast and this activity has resulted in most of the discoveries in this area in recent years. In the Mississippi Delta area, where possible producing horizons from the Miocene-Oligocene sediments reach a depth of more than 15,000 ft., wells are being drilled deeper and deeper in search for production. At present more attention is being given to comparable horizons in Texas than in past years.

The Wilcox-Yegua trend in both the Texas and Louisiana Gulf Coasts is receiving considerable attention. Four new oil fields were discovered in Beauregard Parish, Louisiana, in 1946 from the Cockfield. There is the usual activity in the Cockfield-Yegua or shallow parts of this trend in the Conroe-Tomball area but many of the wildcats in this area are carried to the Wilcox. There are still relatively large untested areas along this trend in Austin, Waller, Montgomery, Liberty, Hardin, Polk, Tyler, and Jasper counties, Texas, and it is probable that fields with relatively large oil reserves will be found in these counties.

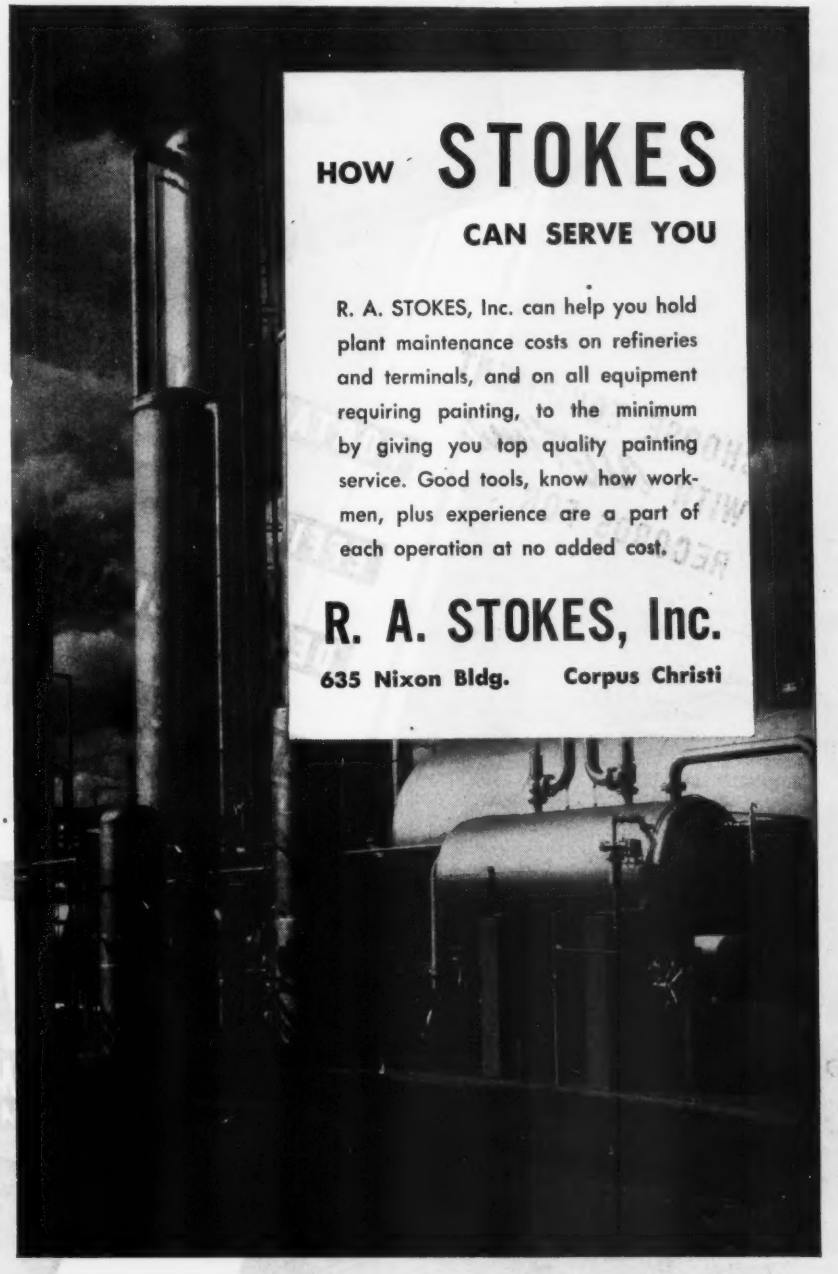
Exploratory activities in the years 1939 to 1943 were concentrated along the Wilcox-Yegua trend with most wells being carried to the Wilcox. A large number of Wilcox fields were discovered during this period. Because of the low permeability of the sands and the great depth of most of these fields, there is every reason to expect the recovery of oil and gas therefrom to be relatively low. This probably accounts in part for the fact that during 1946 activity was not particularly concentrated along the Wilcox trend and most of the Wilcox wildcats drilled were drilled to test this horizon on structures already known from shallow drilling.

The Continental Shelf

An increasing amount of attention is being given to the oil possibilities of the Continental shelf off the coast line of Texas and Louisiana. This area parallels the present coast line and ranges in width from 40 to 125 miles. Present drilling equipment makes it possible to drill in water up to 60 ft. in depth without undue hazards. The strip of Continental shelf above this depth limit averages about 30 miles in width. This strip is comparable in width, then, to the Frio trend of the Texas Gulf Coast. Most of the Continental shelf production, however, will probably come from Miocene beds. A large number of fields are producing from Miocene sands in the Gulf Coast of Louisiana where the upper limits of the Miocene trend migrates inland as it progresses to the east from the Texas Gulf Coast into Louisiana. It is logical to assume that this particular productive trend will continue into the Gulf of Mexico.

The general geologic features of the location of the salt domes of the Gulf Coast can only lead one to believe that other salt domes are present on the Continental shelf. The exact location of these domes will involve intricate geophysical surveys. The extremely high cost of such geophysical operations coupled with the high cost of exploratory drilling over water makes exploration on the Continental shelf a major-company operation. A large number of major companies have purchased leases of submerged lands off the coast of Louisiana.* However, to date, there has not been as great a demand for submerged lands off the coast of Texas, but with the apparent geologic possibilities of this area, there is little doubt but that such a demand will soon develop.

*Critz, James S., Oil Possibilities on the Gulf Coast Continental Shelf; Oil Weekly, January 6, 1947.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Texas Gulf Coast Has Efficient System of Gas Conservation

by William J. Murray, Jr.

IN May 10 issue of The Oil and Gas Journal there is an article by Col. Ernest O. Thompson, chairman of the Railroad Commission of Texas, which describes trends in gas conservation for the State of Texas as a whole. I have been asked, as a member of of Railroad Commission of Texas, to prepare a brief article for the Gulf Coast issue of the Journal dealing with gas conservation in the Texas Gulf Coast. In the interest of brevity and to avoid repetition, reference will be made to this article by Colonel Thompson, and some of its more pertinent statements will be quoted here. It is believed that this article will be more meaningful if read after a careful review of Colonel Thompson's article.

Colonel Thompson reveals that there are 69 gas-conservation plants, costing a total of $127,000,000, which have either been completed, are under construction, or are in the planning stage. The casing-head gas that will be conserved in these projects will total 760 million cubic feet per day, of which 452 million cubic feet will be available for pipe-line transportation and 308 million cubic feet injected back to the formation to maintain reservoir pressure. In Table 1 are listed the casing-head-conservation projects to be located in the Texas Gulf Coast (Railroad Commission Districts 2, 3 and 4). Table 2 is a summary of these projects showing the number completed, the number now building, and the number in the planning stage. These data are compiled as of May 1, 1947, but they are subject to some deviation since the status of these projects and the volume involved frequently change. Tables 1 and 2 contain a few projects not included in the data given in Colonel Thompson's paper since

William J. Murray, Jr., is at present a member of the Texas Railroad Commission. Following graduation from University of Texas, he was instructor in the department of petroleum engineering there, and later became a petroleum engineer and geologist in West Texas. He served the Oil and Gas Division of the Texas Railroad Commission as an oil and gas enforcement officer, deputy supervisor in engineering and conservation in the commission's East Texas district, and as senior petroleum engineer for the Oil and Gas Division. In 1941, Murray entered federal service as conservation engineer for Petroleum Administration for War.

TABLE 1—TEXAS GULF COAST CASING-HEAD GAS CONSERVATION PROJECTS

R.C.C. dist.	Pool	Description of project	Approx. da. vol. involved, M² ft.	Disposition or residue	Status, 4-10-47
2	Heyser	Compression	35.0	Sales	Planning
2	Maurbro	Compression	1.0	Sales	Seeking market
2	McFaddin-Placedo	Ext. and compression	10.0	Sales	Planning
2	North Pettus-Burnell	Ext. and compression	7.0	Sales	Planning
2	South Caesar	Compression	10.0	Sales	Seeking market
2	Tom O'Connor	Ext. and compression	24.3	Sales	Construction started
2	West Ranch	Ext. and compression	16.0	Inj. and sales	Completed
3	Amelia	Compression	2.7	Injection	Completed
3	Anahuac	Ext. and compression	26.0	Sales	Complete—Aug. 1947
3	Clear Lake	Compression	2.3	Sales	Completed
3	Dickinson-Gillock	Ext. and compression	9.0	Sales	Complete
3	Fairbanks	Compression	10.0	Injection	Complete—June 1947
3	Hastings	Ext. and compression	30.0	Sales and inj.	Complete
3	Lovell Lake	Compression	4.0	Injection	Operating
3	Magnet-Withers	Compression	14.0	Sales and gas lift	Planning
3	North Katy	Compression	3.6	Sales	Complete
3	Old Ocean	Ext. and compression	15.0	Sales and inj.	Unitizing
3	Red Fish Reef	High-pressure separation	3.1	Sales	Planning
3	S. Houston	Compression	3.0	Inj. and sales	Planning
3	Stowell (F. Winnie, F.R.)	Ext. and compression	25.0	Sales and inj.	Operating
3	Sublime	Compression	5.0	Injection	Planning
3	Webster	Ext. and compression	19.0	Sales	100% complete
4	Agua Dulce	Ext. and compression	13.5	Sales	Planning
4	Benavides	Compression	3.9	Injection	Operating
4	East Ranch	Compression	0.3	Injection	Operating
4	Garcia	Compression	4.0	Injection	Planning
4	Guerra	Compression	0.3	Injection	Under construction
4	Kelsey	Compression	6.0	Injection	Planning
4	Lopez	Compression	3.0	Injection	Planning
4	Luby	Ext. and compression	5.0	Inj. and sales	Planning
4	Lundell	Compression	2.5	Injection	Under construction
4	Plymouth	Ext. and compression	4.5	Injection	Planning
4	Rincon	Ext. and compression	3.0	Injection	Planning
4	Rooke	Compression	1.5	Injection	Completed
4	Seeligson	Ext. and compression	40.0	Sales	Part matl. on ground, complete Feb. 1948
4	Stratton	Ext. and compression	13.0	Injection	Bldg. by comm. order
4	Sinton	Compression	3.0	Injection	Planning
4	Sun and North	Ext. and compression	12.0	Inj. and sales	Planning
4	Weil	Compression	0.3	Injection	Operating
4	Yturria	Compression	0.3	Injection	Under construction
		Total	391.1		

TABLE 2—STATE OF TEXAS SUMMARY OF CASING-HEAD GAS CONSERVATION PROJECTS, GULF COAST AS OF MAY 1, 1947

Item—	No. of plants	Gas volume M³ ft. daily	Use of residue, M³ ft.*: Sales	Use of residue, M³ ft.*: Injection
Extraction and Compression Plants				
Projects complete	6	114.0	71.0	43.0
Projects building	4	103.3	90.3	13.0
Projects planned	8	58.1	42.1	16.0
Total	18	275.4	203.4	72.0
Compression Plants				
Projects complete	8	18.6	5.9	12.7
Projects building	4	13.1	0.0	13.1
Projects planned	10	84.0	61.5	22.5
Total	22	115.7	67.4	48.3
All Plants				
Projects complete	14	132.6	76.9	55.7
Projects building	8	116.4	90.3	26.1
Projects planned	18	142.1	103.6	38.5
Total	40	391.1	270.8	120.3

*Assuming that in cases where both sales and injection are planned, one-half of the gas will be injected.

they were not reported between March 20 and May 1. However, the basic data are sufficiently similar to furnish a reasonably accurate comparison with the Texas Gulf Coast and to stand relative to the rest of the state. It will be noted that a majority of the projects already completed and under construction are located in the Gulf Coast, and nearly one-half of those now in the planning stage also are to be located in the Texas Gulf Coast. With regard to the total volume of gas involved, it would appear that approximately one-half will be produced in the Gulf Coast.

It is believed that this represents a very creditable program, both with regard to the state as a whole and, particularly, with regard to the Texas Gulf Coast. The oil and gas industry is entitled to a great deal of praise for initiating such a program. However, we must not overlook the fact that this is not a completed program and that some of these planned projects either may be considerably delayed or even never accomplished without diligent efforts on the part of the operators involved and a great deal of cooperation on the part of the producers and the gas-pipe-line companies. Casing-head gas must be given preference by the pipe-line companies, at least in so far as load factor is concerned, because it is neither economically sound nor does it accomplish much in the way of gas conservation to build a gas-compression plant for delivering casing-head gas to a transmission line when such deliveries are accepted by the pipe-line companies during only a part of the year when peak loads are experienced.

Fortunately, much progress has been made recently in this realm. Not too long ago, it was difficult to get gas companies to accept casing head at all, and when it was accepted, it was only with low load factors. Gas companies, now, are much more willing to take casing-head gas and give higher load factors. This has been accomplished voluntarily by the gas companies; perhaps stimulated by the pressure of public opinion but without any compulsory legislation or mandatory order by a regulatory body. This is as it should be because a cooperative program on the part of industry is far more desirable and usually much more efficient and practical than a program based entirely upon regulation.

Gas Markets Increasing

Markets for natural gas from the Gulf Coast are rapidly increasing both outside the area and, of more importance to the welfare of all of the population of the Gulf Coast, for the many new industries which are locating in the Gulf Coast region and which will use gas as a fuel and, in many cases, as a raw material. These expanded markets will make possible a much greater utilization of the casing-head gas now being flared. Also, they will bring with them a problem which we are only touching upon at present but which the amazingly rapid increase in demand may bring into sharper focus in the near future. This problem lies in the fact that many of our gas reserves cannot be considered truly available for market at the present time. A considerable portion of the casing-head gas now being flared should not be marketed, even if markets are available which would make it profitable to deliver this gas to pipe lines, because it is more important to return the gas to the producing oil reservoirs when by so doing the ultimate recovery of oil will be increased.

Furthermore, approximately 50 per cent of the gas reserve of the Texas Gulf Coast (estimated to be 44 trillion cubic feet), is associated with crude oil, either occurring as solution gas dissolved in the oil or in gas caps lying above the oil reserves. In most cases, the marketing of this gas must be delayed until it has served its more important purpose of increasing ultimate oil recovery. The commission has endeavored to restrict the production of gas wells completed in the gas caps of oil reservoirs in order to minimize the loss in oil recovery. From the standpoint of sound conservation, such wells ought not to be produced at all. However, a cooperative program on the part of industry, wherein these gas-cap wells would be shut in and their owners receive a fair compensation for either deferring or completely abstaining from marketing their gas, would be far more desirable and far more likely to afford true conservation than a program of attempted coercion by a regulatory body.

Summary

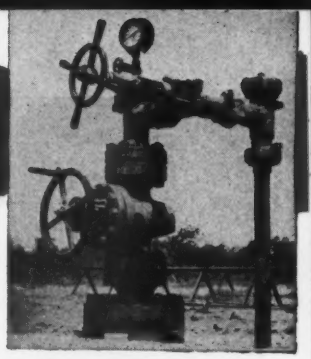
Likewise, the rich condensate reservoirs need to be cycled before the gas is marketed in order not to lose through retrograde condensation much of the recoverable liquid hydrocarbon content. When market outlets were limited, there was not much alternative to cycling, but with the pressure of rapidly increasing markets, we must be careful not to market gas when by so doing we will cause loss of valuable liquids.

In summary, it must be emphasized that gas conservation is inescapably tied in with maximum oil recovery. The economic welfare of the Texas Gulf Coast and the very security of our nation demand that a more complete and efficient recovery of our extremely valuable and irreplaceable reserves of oil and gas be achieved in the future than has been obtained in the past.

Such a conservation program will require a high degree of cooperation among the producers themselves, in order to close in gas-cap gas wells and inefficient oil wells and to cooperatively return to the oil-bearing reservoirs such casing-head gas as is needed to obtain the maximum oil recovery. Likewise, a high degree of cooperation between the producers of gas well gas and the pipe-line companies will be needed in order that the marketing of casing-head gas, which otherwise would be flared, will be given first preference and the production of gas wells in the gas caps of oil reservoirs and gas wells in rich condensate reservoirs which require cycling will either be eliminated or restricted to that required to meet peak emergency loads.

Such a program is an ambitious one and perhaps will not meet with acceptance immediately, but it is a program which the public interest demands and public opinion will doubtless require. It is a program which can be accomplished most effectively by an industry-wide drive for cooperation, with the Railroad Commission taking part only to the extent of issuing such orders as are requested by the industry to assist them in carrying out their cooperative program.

This Little Feller Has a Great Big Job!



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Takes the place of a gate or plug valve on the arm of the tree. Since high pressure wells are usually produced thru a small choke, resulting in low velocity flow thru the tree, the 1-inch opening in this valve is ample to assure unrestricted flow.

UNIBOLT *Flow Manifold*

A UNIBOLT Flow Manifold, in contrast to big and heavy conventional flanged Christmas tree wings, is a "little feller." Employing standard UNIBOLT connections rather than flanges, the manifold is many pounds lighter, yet the unique UNIBOLT design which places more steel in shear actually results in a higher factor of safety for the unit. And although it is a simple, compact and inexpensive manifold, it handles the biggest flow control job with the greatest of ease. Its upkeep is low. Its salvage value is high.

UNIBOLT Flow Manifolds are pressure-tested as units, tee or cross type, in 6000, 10,000 and 15,000 lbs. test. The lower connection on the tee, or cross, is API so that the unit may be flanged above any API flanged master valve of corresponding size.

Complete details are carried in the 1946 Composite Catalog, or a copy of the new UNIBOLT Catalog will be sent on request.

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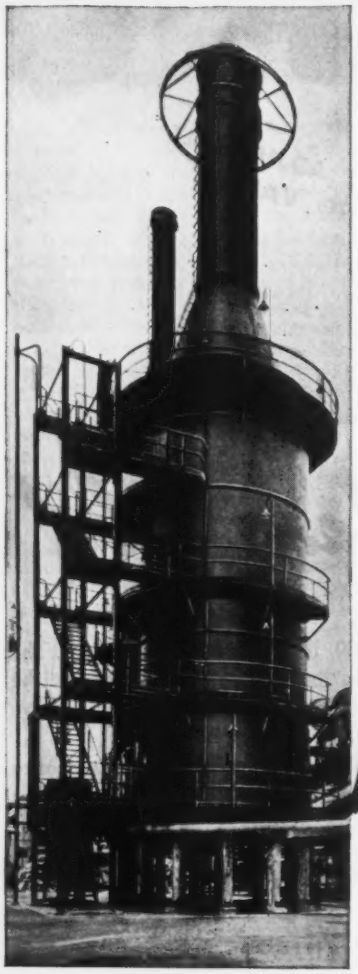

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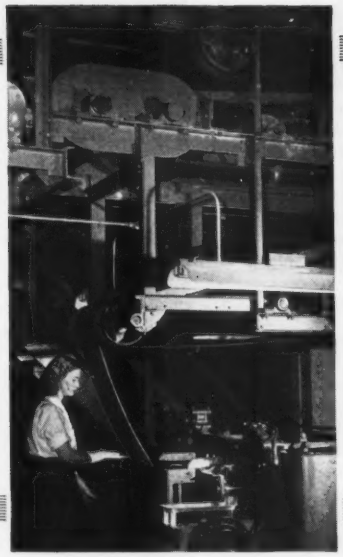


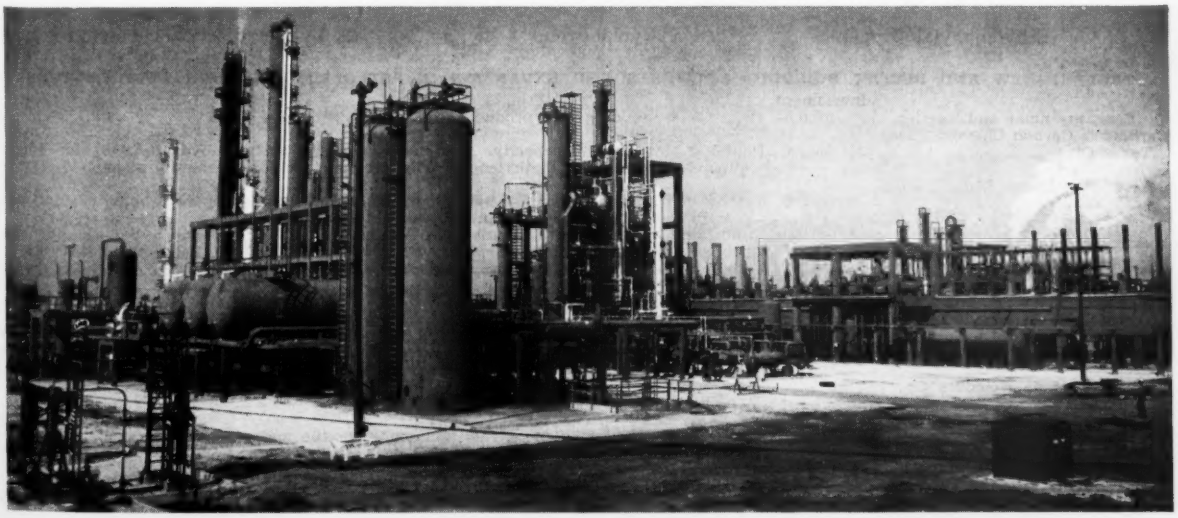
The "end of the line" in synthetic-rubber manufacture. Here in this Humble Oil & Refining Co. plant, the 14-in. strips of synthetic product from refinery gases is cut into blocks, weighed, and packed for shipment to the rubber fabricator

by Arch L. Foster

WITHOUT doubt the greatest chemical development in the Western Hemisphere today, and probably the greatest occidental development in chemistry for all time, is now going on with accelerated speed on the coast of the Gulf of Mexico. Concentrating the output of 13 organic chemical plants (14, if we include the addition agent plant of California Corp., near New Orleans), the chemical industry, in collaboration and combined with the petroleum-refining industry, has invested more than a third of a billion dollars in that area. With the addition of presently building expansions, and those planned for the near future, this total investment, by 1950, will doubtless be greater than a half-billion dollars, with every prospect of its continuing at a pace commensurate with the increased demand for organic chemicals and products derived from petroleum and natural gas.

And the list of chemicals produced and to be made runs the gamut of practically all known organics which are required by the world's civilization in large, industrial quantities. The reasons back of this concentration of production capacity seem, now, to be quite obvious. They are quick and easy water transport, a superabundance of petroleum and natural gas as raw materials, and a third of the nation's refining capacity. Olefinic and other unsaturated hydrocarbons such as ethylene, propylene, butylenes, etc., are available for the synthesis of all sorts of compounds, or paraffinic homologs may be had at low cost for such handling as may be desired. Another reason for locating plants in this area is plenty of space, a mild to subtropical climate, and relatively lower costs for manufacturing operations.

The list of products made or to be manufactured ranges from simple chloride and carbon tetrachloride (CCl_4) to nylon salt for the making of nylon fabrics, all through the olefinic and diolefinic products of ethylene, and similar mono-olefins, styrene for the making of polystyrene,



In the foreground is the new Shell Chemical Co. plant at Deer Park, Houston. Here several very important chemicals are being manufactured; the synthesis of glycerin, one of the outstanding achievements of the chemical world, will be carried out here to produce large quantities of what has always been a natural product

Butadiene is the "black sheep" of the hydrocarbon family; active and reactive, it combines with styrene, mono-olefin, to make the type of synthetic rubber used for tires, etc.; it is made in thousands of tons annually in this Humble Baytown plant, one of several American plants of the kind

synthetic rubber (tire type, GR-S), cyclic (naphthenic) and aromatic (benzene and homologs) hydrocarbons from which practically every type of known organic chemical can be produced by well-known industrially proved processes.

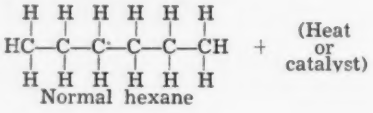
Typical Synthesis Reactions

The companies building and operating these new plants include the largest and most progressive companies in the world, as may be seen in Table 1.

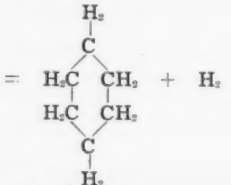
The simplest reaction in the large number employed in these plants is probably that of formation of olefins. This reaction may occur as an incidental reaction in the thermal or catalytic cracking (decomposition) of heavier hydrocarbons or may be carried out in a special operation for the express purpose of forming these products in large yields:

$$\underset{\text{(Ethane instill or natural gases)}}{C_2H_6} + \text{heat} = \underset{\text{(Ethylene)}}{H_2C{=}CH_2} + \underset{\text{(Hydrogen)}}{H_2}$$

The reaction with propane, C_3H_8, or butane, C_4H_{10}, is identical, removing two hydrogen atoms to form the double bond between adjacent carbon atoms, as shown. On occasion and under suitable conditions, hydrogen atoms may be removed from terminal carbon atoms, to form ring compounds or cycloparaffins:

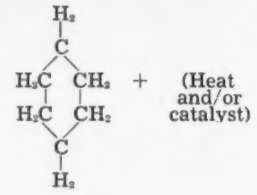


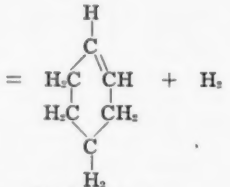
Normal hexane



Cyclohexane

By catalysis cyclohexane may be dehydrogenated partially to form cyclohexene, C_6H_{10}:





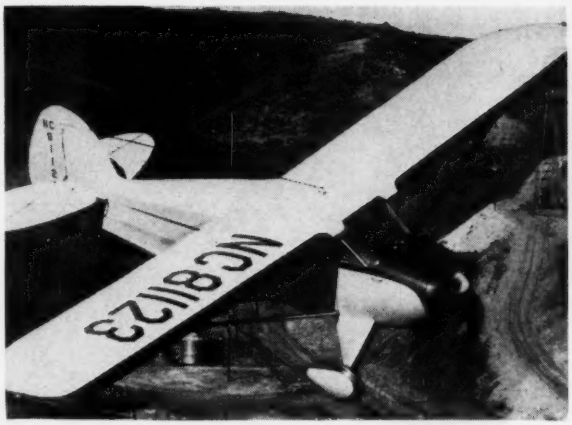
Cyclohexene

Cyclohexene is an intermediate for all manner of chemical syntheses in-

TABLE 1—NEW AND RECENT BUILDING ACTIVITIES AND EXPANSION IN PETROLEUM CHEMICAL MANUFACTURE

Company name and location—	Investment total	New building and products
Carbide & Carbon Chemical Corp., Texas City	$31,000,000	Doubling present plant capacity. Acetone, acetic acid, acetic anhydride, acetylene ethers, ethanol, ethylene and diethylene glycols, ethylene dichloride, methyl alcohols.
Carthage Hydrocol, Inc., Brownsvills, Tex.	20,000,000	Synthetic HC plant, complete. Synthetic gasoline and heavier hydrocarbons; alcohols and oxygenated hydrocarbons. Approximate cost $20,000,000.
Celanese Corp., Bishop, Tex.	12,000,000	Duplicating original unit. Acetic acid, acetone, methanol, formaldehyde, acetaldehyde, propionaldehyde industrial chemical. New research $12,000,000. Laboratory, $3,000,000.
Dow Chemical Co., Freeport, Tex.	150,000,000	Carbon tetrachloride, perchlorethylene, ethylene and diethylene glycol, propylene glycol, etc.
Dow Chemical Co., Freeport, Tex.	.....	Styrene unit. Styrene, polystyrene.
E. I. du Pont de Nemours Co., Orange, Tex.	*30,000,000	Nylon salt and chemical units (estimated $30,000,000)—polythene, CH_3OH, adipic acid. 2,000 men for construction; 700 men for operation. Nylon salt; polythene, methanol, adipic acid, etc. Final total expenditure estimated $100,000,000.
E. I. du Pont de Nemours Co., LaPorte, Tex.	(?)	Phenothiazine, agricultural chemicals.
Jefferson Chemical Co., Port Neches, Tex.	12,000,000	Organic chemicals—ethylene glycol and oxide, textile and plastics intermediates units.
McCarthy Chem. Co., Winnie, Tex.	3,000,000	Organic chemicals—(just starting design and construction).
Monsanto Chem. Co., Texas City	25,000,000	Styrene polymerization facilities. Styrene. Approximate cost $3,000,000.
Rohm & Haas, Houston, Tex.	5,000,000	All units. Plastics, ion exchange resins, etc.
Shell Chem. Co., Houston, Tex.	26,000,000	12 units partly built—glycerin $10,000,000, MEK, ethyl alcohol $3,500,000, acetone, allyl alcohol and allyl chloride, etc., units.
Standard Alcohol Co., Standard Oil Co. (N. J.), Baton Rouge	20,000,000	Ethyl and i-propyl alcohols, oxygenated chemicals; ethers, hydrocarbons.

*Not announced (estimated).



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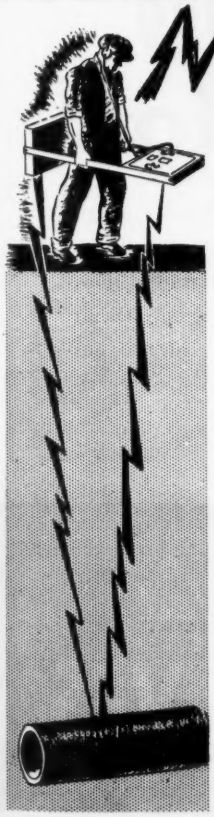

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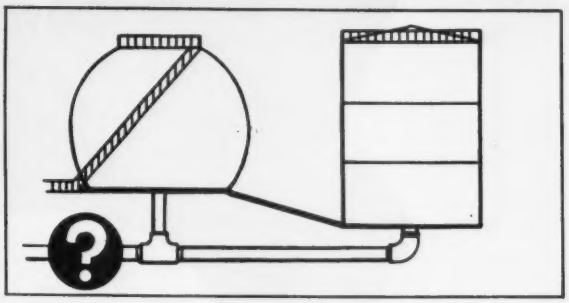
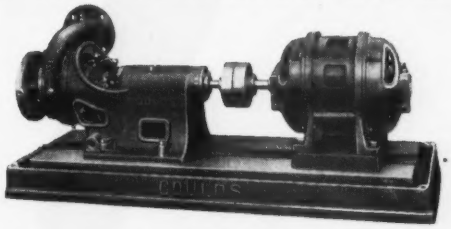


A bulk station requires a pump to handle either gasoline or fuel oil. It must have: A low entrance loss to compensate for maximum temperature the liquid will attain, a capacity of 450 G.P.M. at 75 ft. total head, and, due to varying head conditions, a non-overloading characteristic. Which Goulds pump is *the* pump for *the* job?

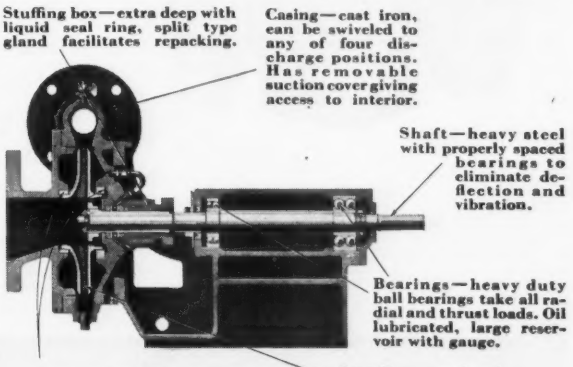
SOLUTION: GOULDS 4J SUPPORT-HEAD CENTRIFUGAL WITH 10 H.P. 1750 R.P.M. MOTOR



The Fig. 3720 pump will handle this job efficiently and economically. Initial cost and upkeep are low. For this application, the Support-Head will be furnished with a stuffing box lubricator feeding into the lantern ring, a hardened shaft sleeve, and metallic packing to reduce wear and leakage.

The Support-Head is made in 16 sizes—from 1½" to 6" and is well-designed for a wide range of applications. When you have a pumping problem, call or write Pump Headquarters or your nearest Goulds office.

Why the Goulds "Support Head" is so reliable


Stuffing box—extra deep with liquid seal ring, split type gland facilitates repacking.
Casing—cast iron, can be swiveled to any of four discharge positions. Has removable suction cover giving access to interior.
Shaft—heavy steel with properly spaced bearings to eliminate deflection and vibration.
Bearings—heavy duty ball bearings take all radial and thrust loads. Oil lubricated, large reservoir with gauge.
Casing wearing rings—renewable, secured against rotation providing necessary sealing and balancing effect.
Impeller—enclosed, single suction, high efficiency. Mechanically and hydraulically balanced.

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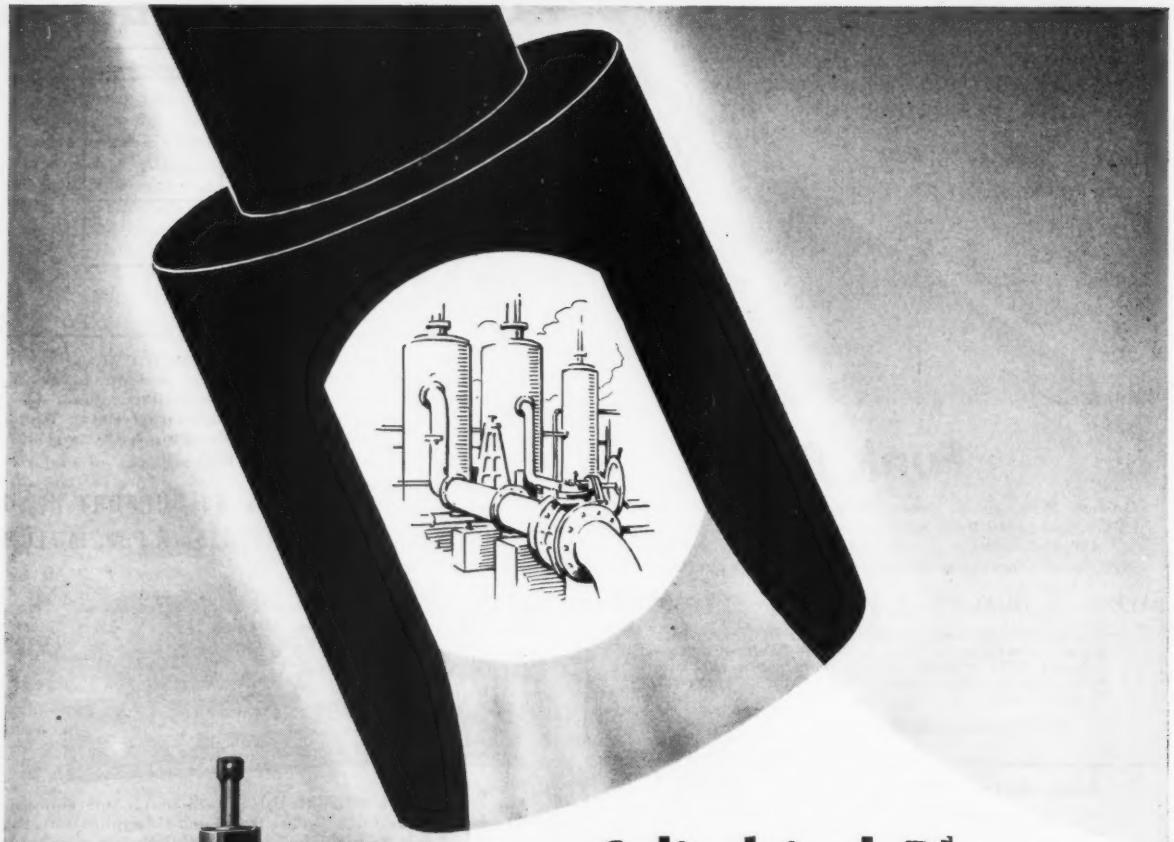
the PUMP FOR *the* JOB



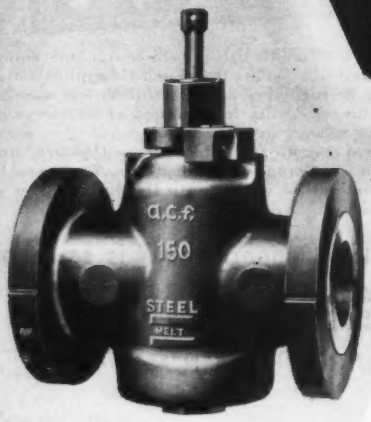


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TABLE 2—RUBBER AND RUBBER INTERMEDIATE PLANTS, GULF COAST, 1947

GR-S Rubber Plants

Company name and location—	Approximate investment	Annual cap. (long tons)
Firestone Tire & Rubber Co., Port Neches, Tex.	$16,585,000	60,000
Goodrich Co., B. F., Port Neches, Tex.	16,585,000	60,000
Goodyear Synthetic Rubber Corp., Houston, Tex.	3,374,000	60,000
General Tire Co., Baytown, Tex.	7,987,000	30,000
Total Gulf Coast, GR-S	$44,531,000	210,000
Percentage, total U. S., GR-S	33.3	30.0

Butyl Plant

		Long tons
Humble Oil & Refining Co., Baytown, Tex.	$26,000,000	30,000
Percentage, total U. S., butyl	49.0	44.0

Butadiene Plants

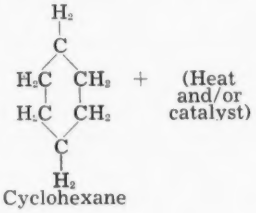
		Long tons
Humble Oil & Refining Co., Baytown, Tex.	$19,400,000	30,000
Neches Butane Products Co., Port Neches, Tex.	58,686,000	100,000
Sinclair Rubber Co., Houston, Tex.	31,500,000	50,000
Humble Oil & Refining Co., Ingleside, Tex.	4,100,000	7,000
Taylor Refining Co., Corpus Christi, Tex.	1,800,000	5,000
Total Gulf Coast, butadiene	$115,486,000	192,500
Percentage, total U. S., butadiene	33.0	30.0

Styrene Plants

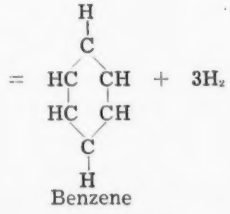
		Short tons
Dow Chemical Co., Freeport, Tex.	$18,150,000	50,000
Monsanto Chemical Co., Texas City, Tex.	19,700,000	51,000
Total Gulf Coast, styrene	$37,850,000	101,000
Percentage, total U. S., styrene	45.7	52.0

cluding dyes and dye-intermediate products, and is useful for the addition of the cyclohexyl group, C_6H_{11}, to other radicals in "aufbau" syntheses.

Or, cyclohexane may be dehydrogenated more completely by the removal of six hydrogen atoms to form benzene, by either thermal and/or catalytic methods:



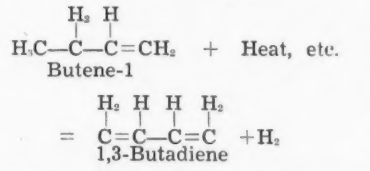
Cyclohexane



Benzene

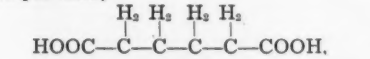
These reactions occur, either by chance or purposely, when benzene, toluene, and other aromatics are synthesized by various methods of aromatization, with or without catalysts. The reaction takes place in the hydroforming operation which employs a dehydrogenation - hydrogenation catalyst; it also occurs in catalytic cracking to form benzene, toluene, xylenes, etc.

From these olefins, diolefins, etc., a huge number of compounds may be synthesized, directly or through a series of reactions. Butene is converted to butadiene:



Butadiene is copolymerized with one-third its mol weight of styrene to form synthetic GR-S (tire) type rubber. Isoprene, a homolog of butadiene, may be formed in a similar manner and is used with a high percentage of i-butylene to make butyl rubber, so important now for certain purposes such as inner tubes and other air and gas containers.

In another branch of synthetic organic products, the olefins may be combined with halogens such as chlorine to form halides and polyhalides as dichlorethane, $ClH_2C—CH_2Cl$; or by substitution for a hydrogen on each carbon dichlorethylene may be formed; ClHC=CHCl, a product used very extensively in chemical syntheses and industrial products. Cyclohexane may be the source of adipic acid,



by oxidation with nitric acid; adipic acid is used in a very large number of syntheses, dyes, perfume bases, nylon salt. This product is made, along with nylon salt or raw nylon material, in the duPont company's new plant at Orange, Tex.

Direct oxidation of hydrocarbons of the lower molecular weights especially has taken two somewhat dissimilar directions. One is typified by the conversion of methane, ethane, and other hydrocarbons up to C_6's or higher directly into monohydric alcohols, to aldehydes and organic monoacids such as formic and acetic, as well as ketones, glycols, hydrocarbon oxides, etc. The other direction taken is that of the so-called Fischer-Tropsch synthesis of hydrocarbons, and oxygenated products, as typified by the German and American developments, mentioned later herein. This synthesis is in two steps; taking methane from natural or other gases as typical:

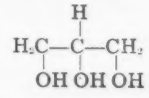
$$2CH_4 + O_2 = \underbrace{(2CO + 4H_2)}_{\text{"Synthesis gas"}}$$

$$x(CO + H_2) = \underbrace{mC_nH_{2n+2} + yC_nH_{2n} + zC_nH_{n+p}}_{\text{Gasoline and heavier hydrocarbons}} + \underbrace{C_nH_{2n+o} — OH, \text{ etc.}}_{\text{Oxygenated compounds}}$$

In this second and general equation the factors x, y, and z, m, n, o, and p are variables; the reaction is highly flexible.

Active Chemical Plants

Among the outstanding chemical plants on the Gulf Coast is that of Shell Chemical Co., subsidiary of Shell Oil Co., Inc., located at Deer Park in connection with the refinery. Having spent, and now spending, some $25,000,000 or more on the various units there, Shell Chemical plans to make and in some cases has started operations for making a large number of organics in large quantities. One of the foremost of these is synthetic glycerin, the synthesis of which was announced a few years ago, and commercial production is soon to be increased considerably. Glycerin is obtained normally as a byproduct of the soap industry, by release of natural glycerin from fats, in the natural synthesis of which glycerin is the alcohol, a trihydric one,

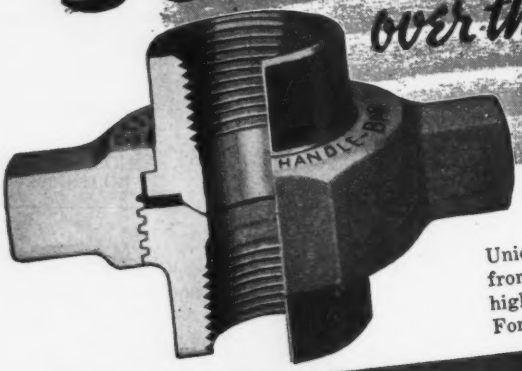


It is synthesized in the plant by the hydration of propane or propylene, after suitable dehydrogenation of the raw hydrocarbon to form the olefin, propylene, $H_2C=CH—CH_3$, which with the aid of chlorine and caustic soda undergoes the addition of three hydroxyl groups to form the final product. Another product is to be glycerin epichlorohydrin,

$CH_2(O)CHCH_2Cl$, a solvent.

In an analogous manner a $3,200,000 unit for synthesis of ethyl alcohol is under construction by Shell to make annually 18,000,000 gal. of this product, formerly made only by fermentation of grains or sugars. Federal alcohol taxes on the product of this unit alone are estimated to be $24,000,000 per year, when in full produc-

Service over the years with FORGED STEEL UNIONS



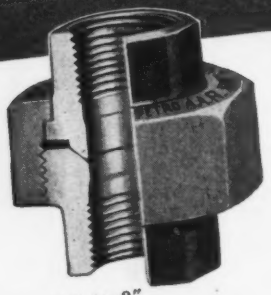
Unions are hot forged from solid round bars of high quality Open Hearth Forging Steel.

Handle-Bar

Hi-Speed Handle-Bar Unions with integral steel to steel seats, or completely fused bronze to bronze seats, black or Udylite (cadmium plated) — sizes from ⅜" to 4" inclusive in 4000 test, sizes 2" to 4" inclusive in 6000 test.

4000 Test Unions furnished with Briggs Standard steam threads in pipe ends, whereas the 6000 Test Union has long pipe ends with API line pipe threads. Nut threads are modified Acme to facilitate easy and speedy assembly and disassembly. Seat design is a 45 degree cone, machined and cold rolled, to a ball seat on male end. Handle-Bar Unions are recommended for all services where they are made up and taken down frequently.

Petro



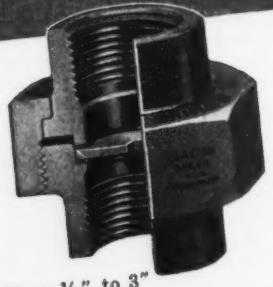
Sizes ⅛" to 3"

PETRO unions have integral steel to steel seats. Made to A. A. R. design. 600 lbs. S. W. P.-2000 lbs. C. W. P. Extra heavy ends and nut with nut threads that are permanently lubricated. The seats are machined and cold rolled.

Pressures from a vacuum to 3000 lbs.: Temperatures from 100° below zero F. to 1000° above zero F.: On Steam, Gas, Air, Oil, Gasoline, Ammonia, Chemicals, and any service in which Steel or Wrought Iron Pipe is used.

Orifice

Ideal for flow control of Steam, Oil, Ammonia, Water, Gas or Air. Also for metering and measuring. 600 lbs. S. W. P. or 2000 lbs. C. W. P. The ORIFICE plate is furnished in cold rolled 18-8 stainless steel. ORIFICE plate and gaskets are set in a groove of solid steel to safeguard against blowing of gaskets and resultant trouble. The ORIFICE union has extra heavy ends and nut with the nut threads permanently lubricated.



Sizes ¼" to 3"

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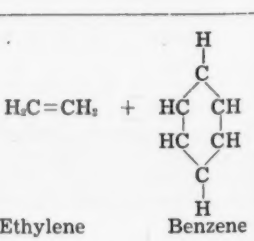
tion, and will employ some 140 people in addition to the 600 to 700 now working in the chemical plant. Waste refinery gases, especially ethylene, is the raw material used. Isopropyl alcohol output is to be increased by 100,000,000 lb. per year; this product is made from the same raw material as is glycerin, propylene from refinery gases. Acetone will be made also from the same intermediate; also methylethylketone, butyl alcohols, and allyl alcohol and chloride. The list of commercial products in which one or more of these materials are used is essentially a list of organic products the world over. A most useful product also is named D-D, a fumigant for soils, which destroys nematodes, wire worms, garden centipedes, and other vegetable-eating pests.

In a more or less similar phase of the industry is the large and growing plant of Celanese Corp., located at Bishop, Tex., which produces aldehydes, alcohols, acids; ketones, glycols and diglycols; numerous other products are or can be made, depending on the market demand and the raw material available. The plant originally cost some $12,000,000, but it is understood that expansion going on now will about double that investment. In this case the raw material is natural, not refinery gases. Many of the products made go into the resins and plastics industries, especially formaldehyde, acetone, propionaldehyde, and normal propyl alcohol.

Monsanto Chemical Corp.'s huge styrene plant was built under war pressure to make one synthetic-rubber ingredient. Located at Texas City in reach of the waste gases of three or more refineries, it is rated at 51,000 short tons of styrene per year, enough to make its part of more than 200,000 tons of synthetic tire rubber annually. Styrene is also employed in the synthesis of a resin or plastic, polystyrene, as its name implies a huge-moleculed polymerization product of the monomer, styrene. Styrene is synthesized by dehydrogenation or cracking of ethane and propane to ethylene, $H_2C{=}CH_2$. This olefin is combined with benzene in the presence of a catalyst like anhydrous aluminum chloride to form ethylbenzene, which is again cracked under heat and pressure to dehydrogenate the side chain to styrene or phenylethylene, as follows:

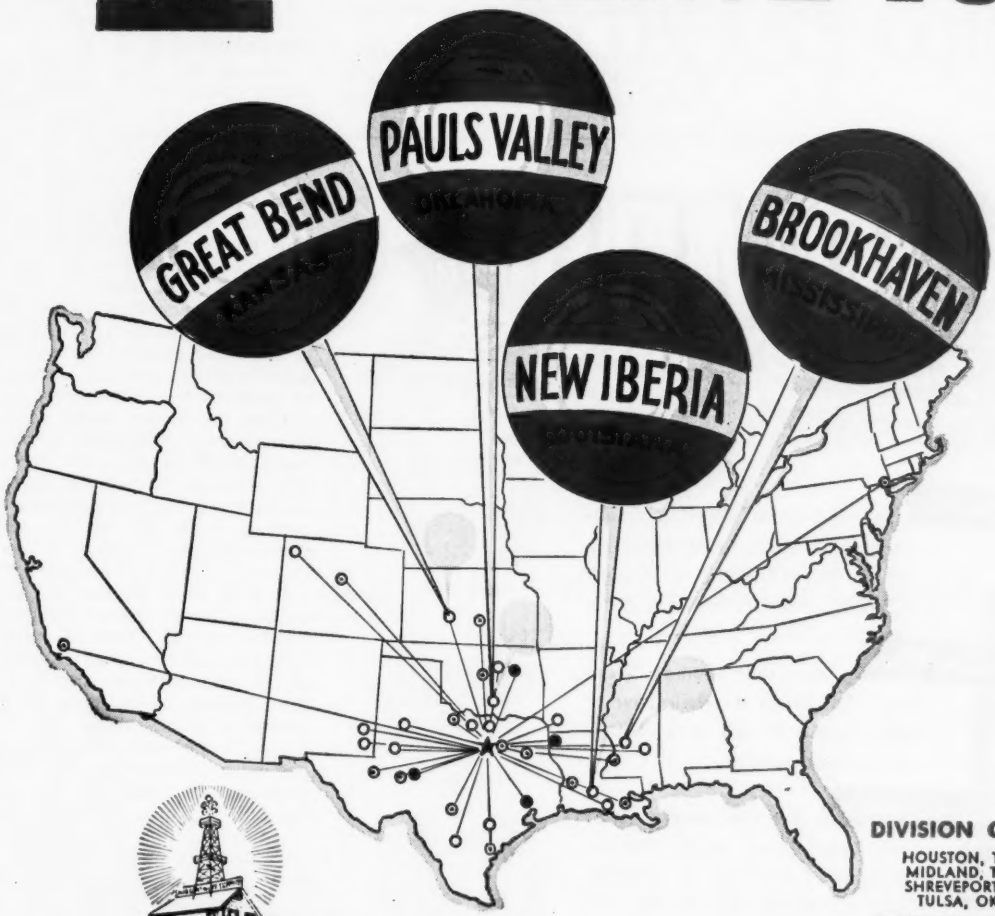
$$H_2C{-}{-}CH_3 + \text{heat} = H_2C{=}CH_2 + H_2 \qquad (1)$$



$H_2C{=}CH_2$ + Benzene

Ethylene

4 NEW STORES TO SERVE YOU!



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MID-CONTINENT
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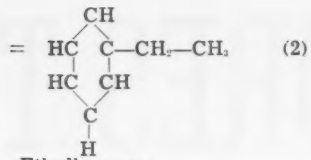
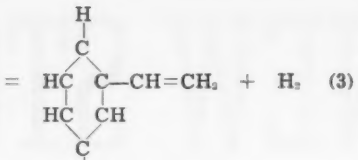
General Offices Mid-Continent Bldg. FORT WORTH, TEXAS



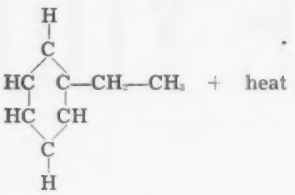
Ethylbenzene

(2)



Styrene

(3)



New building includes a polystyrene unit to make 20,000 tons per year of that resin; the plant employs some 550 persons, including 50 technical people.

Employing some 1,000 employes, including 130 technical men, Carbide & Carbon Chemicals Corp.'s Texas City plant in doubling its present capacity for the production of oxygenated and other organic chemicals from waste refinery gases. The expansion program will necessitate the employment of some 1,600-1,800 by late 1947, and during 1947 this number will climb to 2,000-2,200. This plant also makes alcohols, ketones, aldehydes, acids such as acetic and its anhydride, glycols, butyl and ethyl alcohols. The new capacity will produce "vinyl plastic salt," the crude product which eventually is formed into vinylite resin; no resin will be fabricated at this plant, the raw product going to other plants.

Among the other companies and plants operating or building on the Gulf Coast are Carthage Hydrocol, Inc., putting $20,000,000 or more into a plant to make 6,000 bbl. per day of motor and other fuels from natural by the American improvement on the so-called Fischer - Tropsch synthesis. This has been made possible by developments in a proper, cheap, and rugged catalyst which produces olefins and isoparaffins in the gasoline range (iron powder); the adaptation of the fluid catalyst principle to the main reaction, and the developments of methods for manufacture of cheap oxygen on a very large scale. Dow Chemical Co. is reported to be investing $150,000,000 in plants at Freeport and vicinity for making all types of products, including metallic magnesium from sea water. Jefferson Chemical Corp., a union of The Texas Co. and American Cyanamid, is building near Port Neches, in the Port Arthur district, a plant for the manufacture of all types of oxygenated organic chemicals, ethylene oxide and glycol, and others. Rohm & Haas, of Philadelphia, is building an organic chemical plant along the Houston Ship Channel area, about which little has been announced. The McCarthy interests are designing and planning the building of a $3,000,000 chemical plant as an initial start into the chemical business. Other matters have been proposed, it is understood, but no further data are available at this writing regarding any definite plans.

THOMAS Flexible COUPLINGS

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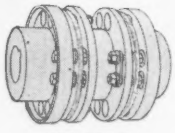
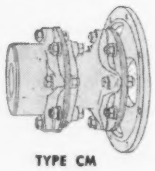
SPECIFIED WHEREVER 100% DEPENDABILITY IS DEMANDED

Refiners specify Thomas "Flexible" Couplings for PUMPS, COMPRESSORS, COAL PULVERIZERS, COOLING TOWERS and GENERATOR SETS.



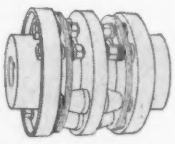
TYPE DBZ-C

Pipe Line Men know that Thomas "Flexible" Couplings on their Low or High Speed Pumps give 100% dependable service.



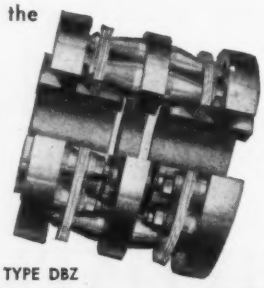
TYPE CM

Drilling Engineers get the most out of their equipment with Thomas "Flexible" Couplings on Engine, Gear and Mud Pump Drives.



TYPE DBZ-B

In the Laboratory Thomas "Flexible" Dynamometer Couplings assure the greatest accuracy.



TYPE DBZ

Thomas Flexible All-Metal Couplings Have No Wearing Parts. BACKLASH, FRICTION and CROSS-PULL ARE ELIMINATED.

NO LUBRICATION IS REQUIRED!

Write for the new Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

Gravity Interpretation

A 40-page reprint from the Quarterly Journal of the Geological Society of London is entitled "Geological Factors in Gravity Interpretation Illustrated by Evidence from India and Burma." The authors, P. Evans and W. Crompton, describe results of an intensive gravity survey of Burma and northeastern India, on which gravity anomalies were determined at over 6,000 stations, and on which an endeavor was made to resolve the anomalies into the portions due to known geological causes and the regional portions due to deep-seated variations in density.

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12,000-Ft. Drilling

becoming common on Gulf Coast as exploration and development continue to move to successively greater depths

by Neil Williams

GENERAL exploration and development on the Gulf Coast is continuing to move to successively greater depths. Whereas, only a relatively few years ago wells to 9,000 and 10,000 ft. were considered deep, drilling in this district at depths of 12,000 ft. now is becoming common. Production already has been found at several places at depths below 13,000 ft., and with exploration reaching to still lower levels, development in turn is spreading at these greater depths.

The first 12,000-ft. hole for the district was drilled in 1937. This test, Stanolind Oil & Gas Co. 1 Stovall, on the South Abbeyville prospect in Vermilion Parish, Louisiana, was abandoned as dry at 12,133 ft. In the intervening 10 years up to May 1, the list of 12,000-ft. tests has been increased to 224. Of these, 51 (Table 1)

TABLE 1

Company, Well, Location—	Total depth (ft.)	Comp. depth (ft.)	Date completed, status
Phillips Petroleum Co.—3 Fannie Schoeppe, Millican, Brazos County, Texas	16,655	.....	July 1944, Abandoned
The Texas Co.—6 Yturria L. & L. Co., Raymondville, Willacy County, Texas	16,006	.....	April 1947, Testing gas sands
Gulf Refining Co.—1 State, Wildcat, Monroe County, Florida	15,455	.....	April 1947, Abandoned
Humble Oil & Refining Co.—10 E. F. Milo, Tomball, Harris County, Texas	15,452	5,600	Dec. 1945, Oil producer
Quintana Petroleum Co.—3-D South Tex. Synd., Wildcat, McMullen County, Texas	15,301	.....	Feb. 1945, Abandoned
The Texas Co.—2 State-Barataria, Queen Bess Island, Jefferson Parish, Louisiana	14,577	.....	Sept. 1946, Abandoned
The Texas Co.—1 State-E. Barataria Bay, Queen Bess Island, Plaquemines Parish, La.	14,490	11,407	Dec. 1945, Cond.-gas prod.
Shell Oil Co., Inc.—3 Smith-State, Weeks Island, Iberia Parish, Louisiana	14,395	13,888	March 1947, Oil producer
Abercrombie-Harrison—1 McDonald, Old Ocean, Brazoria County, Texas	14,378	12,709	May 1943, Oil producer
The Texas Co.—1 LaFourche Basin, Queen Bess Island, Jefferson Parish, Louisiana	14,333	.....	Drilling; depth as of April 30
Shell Oil Co., Inc.—2 Smith-State, Weeks Island, Iberia Parish, Louisiana	14,301	13,778	April 1946, Oil producer
California Co.—4 E. P. Brady, Alliance (wildcat), Plaquemines Parish, Louisiana	14,187	9,082	October 1946, Gas condensate
Stanolind Oil & Gas Co.—4 Franz Huebner, Lucky, Matagorda County, Texas	14,100	8,047	October 1946, Oil producer
Shell Oil Co., Inc.—1 Smith-State, Weeks Island, Iberia Parish, Louisiana	14,023	13,250	April 1945, Oil producer
The Texas Co.—45 State-Lake Barre, Lake Barre, Terrebonne Parish, Louisiana	14,021	11,924	October 1946, Gas-condensate
Pan American Prod. Co.—1 Claude Boudreaux, Lake Quitman, Terrebonne Parish, La.	14,012	.....	March 1947, Abandoned
Union Oil Co. of Calif.—4-C Louisiana Furs, Fresh Water Bayou, Vermilion Parish, La.	13,941	11,555	December 1946, Gas
British-American Oil Co.—1 A. M. Dupont Corp., Lapeyrouse, Terrebonne Parish, La.	13,857	12,640	October 1946, Oil producer
Gulf Refining Co.—1-F. Calcasieu Nat. Bk., Hayes, Calcasieu Parish, Louisiana	13,856	.....	December 1946, Abandoned
Magnolia Petroleum Co.—1 L. F. Duos, Mamou, Evangeline Parish, Louisiana	13,800	11,780	August 1946, Oil producer
Union Producing Co.—1 Minnie Brown, Aqua Dulce, Nueces County, Texas	13,728	4,603	February 1939, Gas producer
The Texas Co.—2 Bender Estate, Humble, Harris County, Texas	13,728	.....	February 1947, Abandoned
Superior Oil Co.—3 State, Lake Calcasieu, Cameron Parish, Louisiana	13,610	.....	1940, Abandoned
Union Producing Co.—2 Buckley Bourg, Bayou DeLarge, Terrebonne Parish, Louisiana	13,586	13,586	1940, Oil producer
The Texas Co.—1 Bender Estate, Humble, Harris County, Texas	13,561	.....	1946, Abandoned
Union Producing Co.—1 Fitzpatrick & Vizard, Bayou DeLarge, Terrebonne Parish, La.	13,560	13,490	July 1943, Gas-condensate
Humble Oil & Refining Co.—2 Gulf Coast Realties, Sunniland, Collier County, Florida	13,512	.....	October 1944, Abandoned
Sun Oil Co.-Sohio Oil Co.—3 Elizabeth Regan, Egan, Acadia Parish, Louisiana	13,500	11,880	May 1946, Gas-condensate
Atlantic Refining Co.—3-B Lutcher-Moore, Reserve, St. John the Baptist Parish, Louisiana	13,477	.....	November 1945, Abandoned
Humble Oil & Refining Co.—1 State-Hogg Bayou, Hogg Bayou, St. Mary Parish, Louisiana	13,423	.....	March 1947, Abandoned
Superior Oil Co.—1 La Terre, Lake Decade, Terrebonne Parish, Louisiana	13,417	.....	1943, Gas-condensate
Fohs Oil Co.—1 Bay Baptiste, Bay Baptiste, Terrebonne Parish, Louisiana	13,409	11,178	August 1938, Gas-condensate
Humble Oil & Refining Co.—2 Armstrong, Tom Armstrong, Kenedy County, Texas	13,369	.....	April 1945, Abandoned
Fohs Oil Co.—1 Buckley Bourg, Bayou DeLarge, Terrebonne Parish, Louisiana	13,333	13,266	July 1938, Gas-condensate
The Texas Co.—3-B Rigolets Fur Co., LaFitte, Jefferson Parish, Louisiana	13,300	10,286	October 1945, Oil producer
Humble Oil & Refining Co.—1 L. Treadwell, Punta Gorda, Charlotte County, Florida	13,300	.....	December 1945, Abandoned
Superior Oil Co.—1 McWhorter, Lake Creek, Montgomery County, Texas	13,293	11,800	1942, Oil producer
Humble Oil & Refining Co.—1 Cote Blanche, Cote Blanche Area, St. Mary Parish, La.	13,281	.....	December 1946, Abandoned
Fohs Oil Co.—1 Buckley Mohler, Bayou DeLarge, Terrebonne Parish, Louisiana	13,270	.....	September 1939, Abandoned
Amerada Petroleum Corp.—1 Waitschies, North Fannin, Goliad County, Texas	13,266	Shallow	October 1944, Oil producer
The Texas Co.—44 State-Lake Barre, Lake Barre, Terrebonne Parish, Louisiana	13,259	11,788	July 1945, Gas condensate
Humble Oil & Refining Co.—1-B Houston Farms, Halls Bayou, Brazoria County, Texas	13,253	10,917	February 1943, Gas-condensate
Stanolind Oil & Gas Co.—3-B Calcasieu, South Elton, Jeff. Davis Parish, Louisiana	13,210	.....	June 1938, Abandoned
Sun Oil Co.—6 D. J. Sullivan, Canales-Sullivan, Brooks County, Texas	13,206	10,180	August 1946, Gas-condensate
Humble Oil & Refining Co.—1 W. W. Moore, Jr., Bonweir Area, Newton County, Texas	13,195	.....	April 1946, Abandoned
Humble Oil & Refining Co.—1-B Bell, South Oberlin, Allen Parish, Louisiana	13,150	12,662	February 1946, Gas-condensate
Gulf Refining Co.—3 Ruth Fleming et al, Wildcat, St. Martin Parish, Louisiana	13,141	10,742	October 1946, Gas-condensate
Continental Oil Co.—1 Adolph Hebert, Big Lake, Cameron Parish, Louisiana	13,084	8,586	Sept. 1943, Gas-condensate
Gulf Refining Co.—1 DeArmas, Grand Bay, Plaquemines Parish, Louisiana	13,023	.....	April 1946, Abandoned
Tide Water Associated Oil Co.—29 Buras Levee, Venice, Plaquemines Parish, Louisiana	13,020	12,039	April 1946, Gas-condensate*
Gulf Refining Co.—1 Hooks Estate, Hankamer, Liberty County, Texas	13,011	.....	September 1945, Abandoned
Continental Oil Co.—1 Mrs. A. Dobbertine, Johnson Bayou, Cameron Parish, Louisiana	13,008	.....	October 1945, Abandoned

*First completed at 13,000-13 ft.

Scores of wells in gas condensate fields, where unprotected tubing requires replacement as often as every few months due to severe internal corrosive action, are now being safeguarded by "TK-2".

Seven years ago, Tube-Kote engineers began experimenting with corrosion-resistant baked-on plastic compounds and in 1943 "TK-2" was developed. Since then, continuous and exhaustive laboratory and field tests, in which "TK-2" has been exposed to practically every known oilfield corrosive condition, have led to commercial applications of this remarkable compound. To date, more than half a million feet of tubing have been processed internally with "TK-2", and the development of this process has been heralded as a most significant advancement in corrosion prevention work.

To acquaint engineers and operators with "TK-2", an informative pamphlet has been prepared and will gladly be sent on request.

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INCREASE PRODUCTION
Clean Out With
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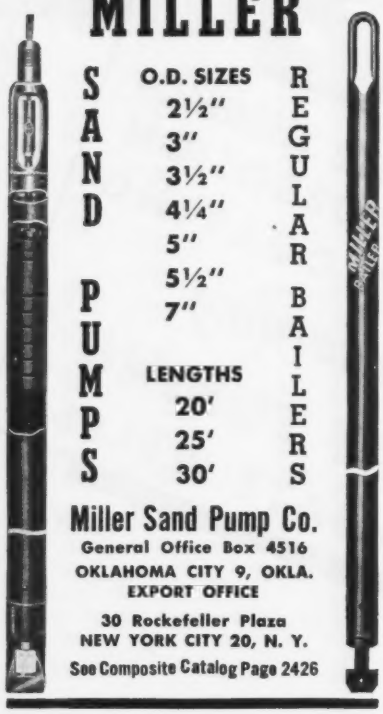

SAND PUMPS

O.D. SIZES
2½"
3"
3½"
4¼"
5"
5½"
7"

LENGTHS
20'
25'
30'

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See Composite Catalog Page 2426

TABLE 2—NUMBER OF TESTS DRILLED BELOW 12,000 FT. BY YEARS
(Based on year hole finished)

Year	Below 16,000 ft.	15,000 to 16,000 ft.	14,000 to 15,000 ft.	13,000 to 14,000 ft.	12,000 to 13,000 ft.	Total
1947	1	1	2	2	21	27
1946	0	0	5	13	39	57
1945	0	2	2	7	33	44
1944	1	0	0	2	26	29
1943	0	0	1	4	10	15
1942	0	0	0	1	9	10
1941	0	0	0	0	11	10
1940	0	0	0	2	5	7
1939	0	0	0	2	12	14
1938	0	0	0	3	2	5
1937	0	0	0	0	5	5
Total	2	3	10	36	173	224

have been drilled to depths in excess of 13,000 ft., including 36 to depths from 13,000 to 14,000 ft.; 10 to depths of 14,000 to 15,000 ft.; 3 to 15,000 to 16,000 ft., and 2 to below 16,000 ft.

Deepest Test on Coast

Drilled to 16,655 ft., Phillips Petroleum Co. 3 Fannie Schoeppe, located on the Millican dome in Brazos County, Texas, still is the deepest test on the Gulf Coast, although its record was set in February 1944, and in the meantime has been exceeded by two tests in other areas. The other 16,000-ft. test in this district is The Texas Co. 6 Yturria Land & Livestock Co., in Willacy County, Texas, which attained a depth of 16,006 ft. on April 11, this year. At the latter depth, it has set 4-in. pipe and, as this is written, is preparing to test high-pressure gas sands which were encountered just above the bottom.

TABLE 3—NUMBER PRODUCING WELLS COMPLETED BELOW 12,000 FT. BY FIELDS

Field—County or Parish—	No. below 13,000 ft.	No. at depths 12,000-13,000 ft.
Bayou DeLarge, Terrebonne*	3	0
Bayou Sale, St. Mary*	0	1
Lake Hermitage, Plaquemines*	0	1
Lake Pelto, Terrebonne*	0	1
Lapeyrouse, Terrebonne*	0	1
Old Ocean, Brazoria†	0	1
South Oberlin, Allen*	0	1
Venice, Plaquemines*	0	1
Weeks Island, Iberia*	3	1
Total	6	8

*Louisiana. †Texas.

Deepest production in the world is located at Weeks Island in Iberia Parish, Louisiana, where Shell Oil Co., Inc., has completed three wells in succession the past year from a Miocene sand at depths ranging from 13,250 to 13,888 ft. All have been good wells, the most recent and the deepest flowing on test at the rate of 502 bbl. daily of 33° A.P.I. oil through a 10/64-in. choke. This test was drilled to a total depth of 14,396 ft. In the same field, Shell has another good well producing from a Miocene sand at a total depth of 12,395 ft.

Weeks Island is the second Gulf Coast field to produce from sands below 13,000 ft., the other being Bayou DeLarge, Terrbonne Parish, where Union Producing Co. has three wells making gas and condensate from a Miocene sand around 13,300 ft. First of these wells was drilled by Fohs Oil Co. and completed in July 1938. Until the development at Weeks Island, Bayou DeLarge held the distinction of having the deepest production in the world.

Nine Fields Below 12,000 Ft.

Including Weeks Island and Bayou DeLarge, nine fields on the Gulf Coast now have production in sands at depths below 12,000 ft. (Table 3). Eight of these are in Coastal Louisiana and one (Old Ocean, Brazoria County) in the Upper Texas Gulf Coast. In all, there are 14 wells with such production. In most instances, however, the production consists of

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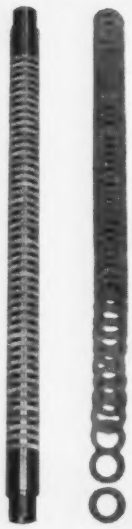

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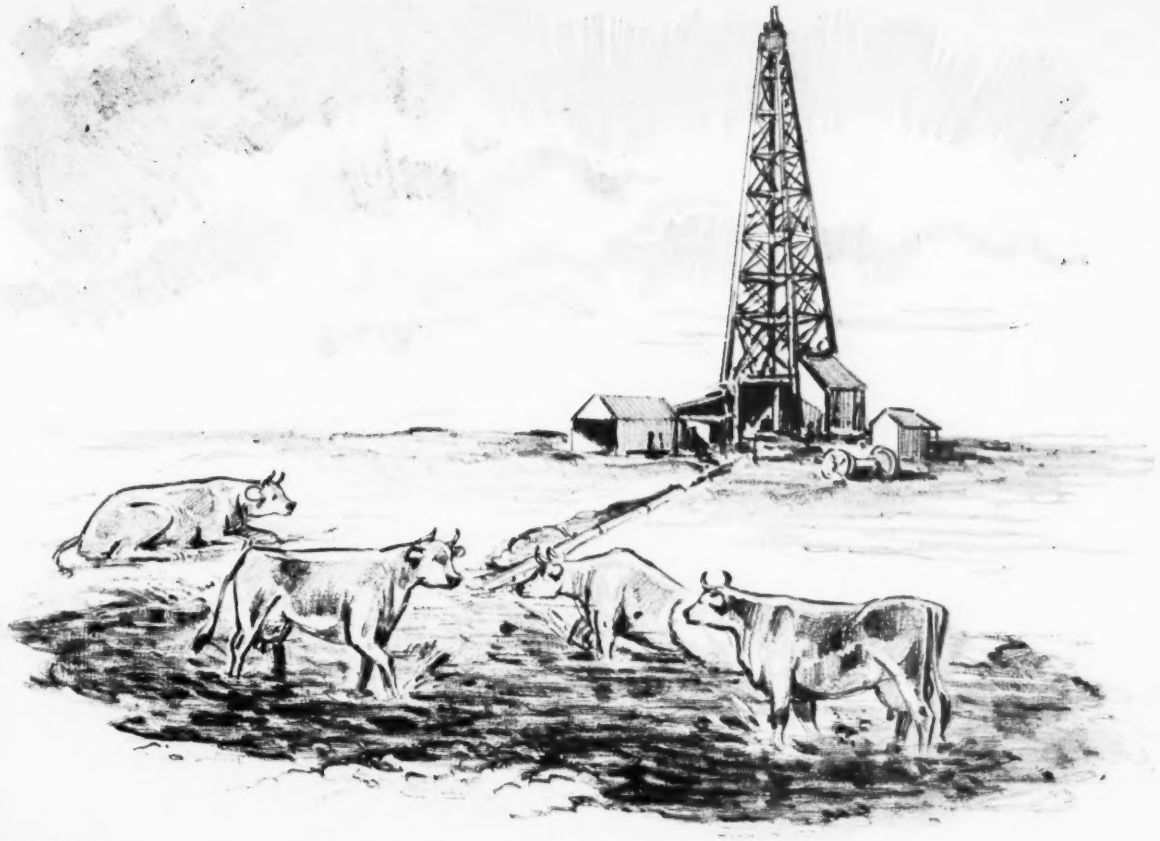

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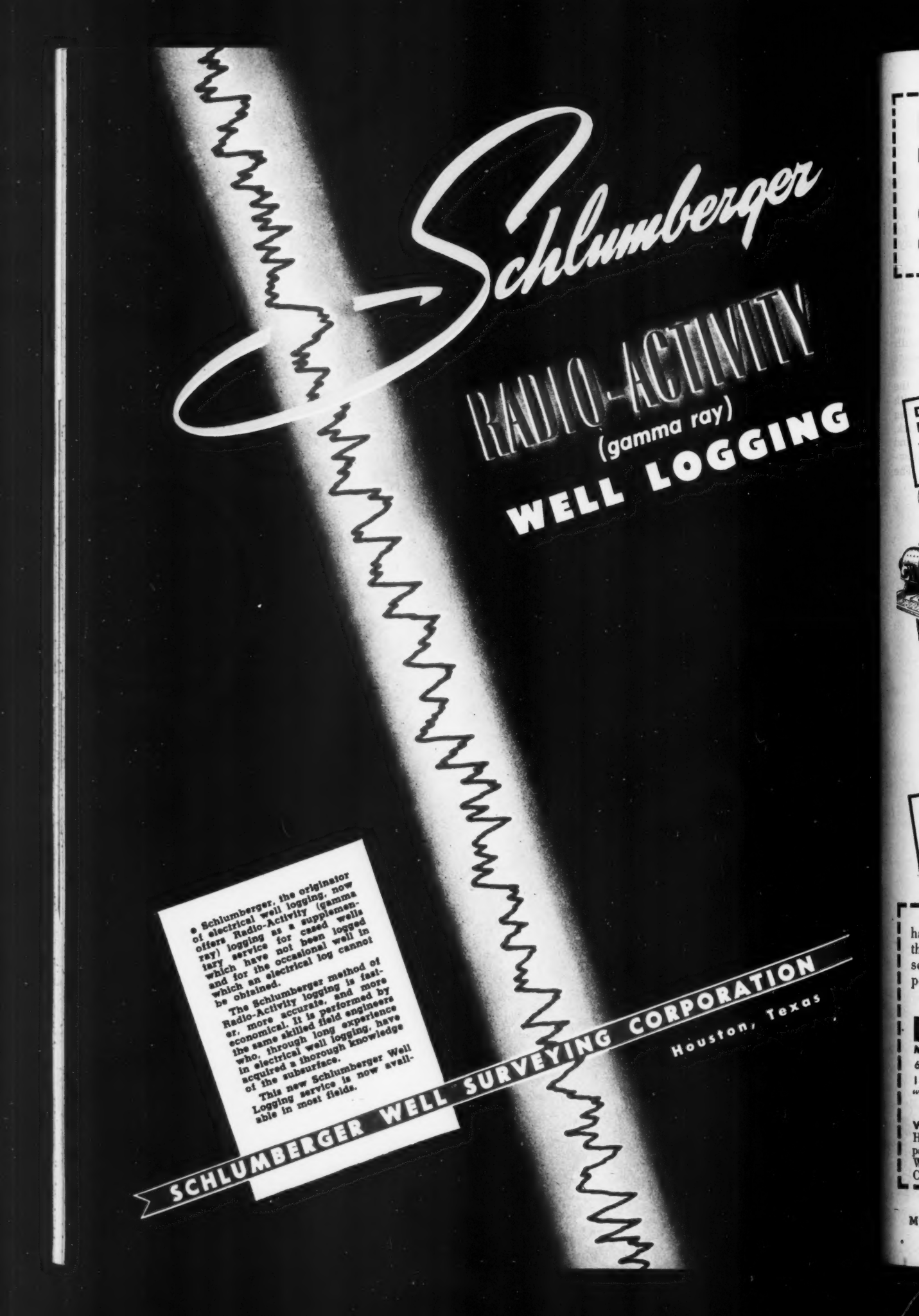
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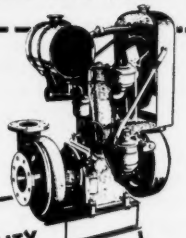

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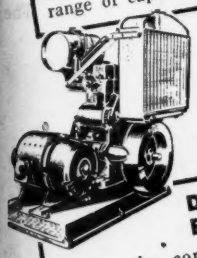

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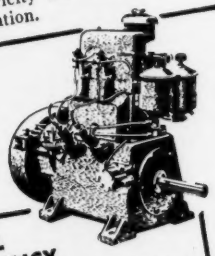

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gas and condensate. Many of the tests which have been drilled below 12,000 ft. have encountered showings either of gas and condensate or oil, indicating that deep sands on the Gulf Coast offer extensive potentialities for development of additional reserves.

Although the majority of wells below 12,000 ft. have been on the Louisiana coast, this exploration has been far from localized. Reflecting this is the fact that the 51 wells drilled below 13,000 ft. represent 42 different fields or areas scattered all along the coast. It is noted that although coastal Louisiana, because of its thicker section, offers the greater potentialities for deep development, and more deep wells have been drilled in that area, the deepest wells have been on the Texas Coast.

Tests Since 1942

Of the 224 tests below 12,000 ft., 182 have been drilled since 1942 (Table 2) which includes the war years, when a concerted wildcatting effort was made to uncover additional reserves. Twenty-seven of these have been drilled this year (4 months), and if the present rate of deeper drilling keeps up, the total number will exceed the peak reached during 1946. Table 2 reflects the increasing trend toward deeper drilling by years, showing an increasing number of wells drilled to successively lower levels each year. Six tests currently are drilling at depths below 12,000 ft., which do not include tests which have been started with objectives of these depths.

With its thick sedimentary depositions, estimated as much as 30,000 to 40,000 ft. in places, the Gulf Coast is a region in which deeper drilling for the present is limited only by the need for finding new production and by the capacity of modern equipment and techniques to reach these lower horizons. In the deepest wells so far drilled stratigraphically, formations currently prolifically productive in more inland fields as yet have not been reached. The deepest test, Phillips 3 Fannie Schoeppe, is reported to have reached the Lower Cretaceous, but Brazos County, in which it is located, is one of the inland fringe of coastal counties. Some of the deepest coastal Louisiana tests, particularly those in the Mississippi delta area and immediately along the coast, did not get out of the Miocene and still had even the prolific lower Oligocene formations of the Texas Coast ahead of them.

Equipment now is being designed and made available for handling the loads of 20,000-ft. drilling, and with the gradual development of equipment and methods for meeting the problems of abnormally high pressures and temperatures being encountered in many of these deeper tests, exploration to these ultra great depths is regarded as an early probability.

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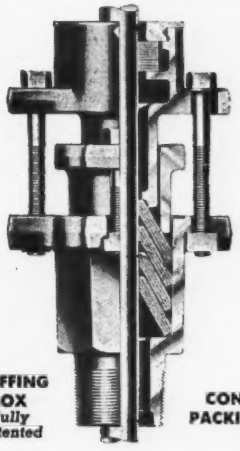

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Giant Barge Drilling Rig

One of Most Modern on Gulf Coast

by E. H. Short, Jr.

THE Sid W. Richardson giant steam drilling barge which recently spudded in on a wildcat location 8 miles northwest of Pointe a la Hache, La., is one of the most up-to-the-minute barge rigs ever placed in operation on the Gulf Coast.

This drill barge is 140 ft. long, 54 ft. wide, and 12 ft. deep. The boiler barge is 100 ft. long by 29½ ft. in width. Both units were built by Levingston Shipbuilding Co. at Orange, Tex., in the record time of 90 days, and Jones & Laughlin Supply Co. provided a large part of the equipment used on the barge. Many unique features for improving both drilling efficiency and safety were suggested during its construction by Ed Hill, general superintendent for Sid W. Richardson, and "Skinny" Ratcliff, drilling superintendent.

The superstructure of this twin-hull drilling barge which is 14 ft. 3 in. high and extends 82 ft. from the after end of each hull, supports the derrick, draw works, rotary, and other drilling equipment. The hulls may be separated during passage through narrow canals.

Mounted on the upper deck of the barge is a 136-ft. Emsco derrick with a 30-ft. base and equipped with leg attachment for jacking up derrick. The draw works is 3410 Ideal and the rotary is an Ideco N-23½ powered by a No. 9 Oil Well engine. The

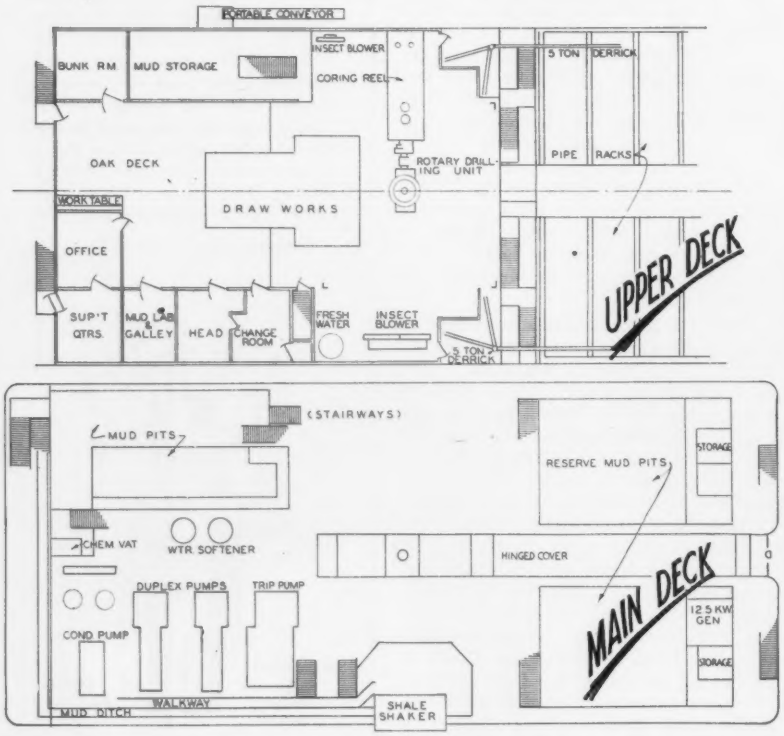


Fig. 1—Upper and main decks of twin-hull barge showing location of major items of equipment and housing facilities

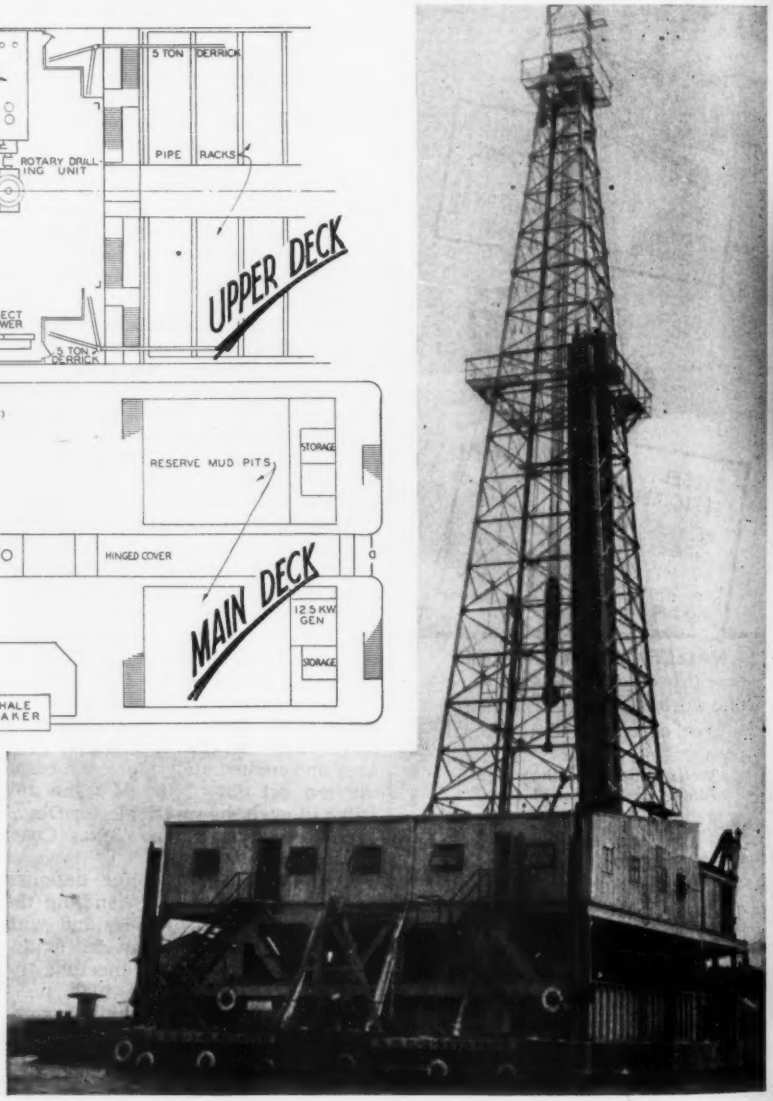
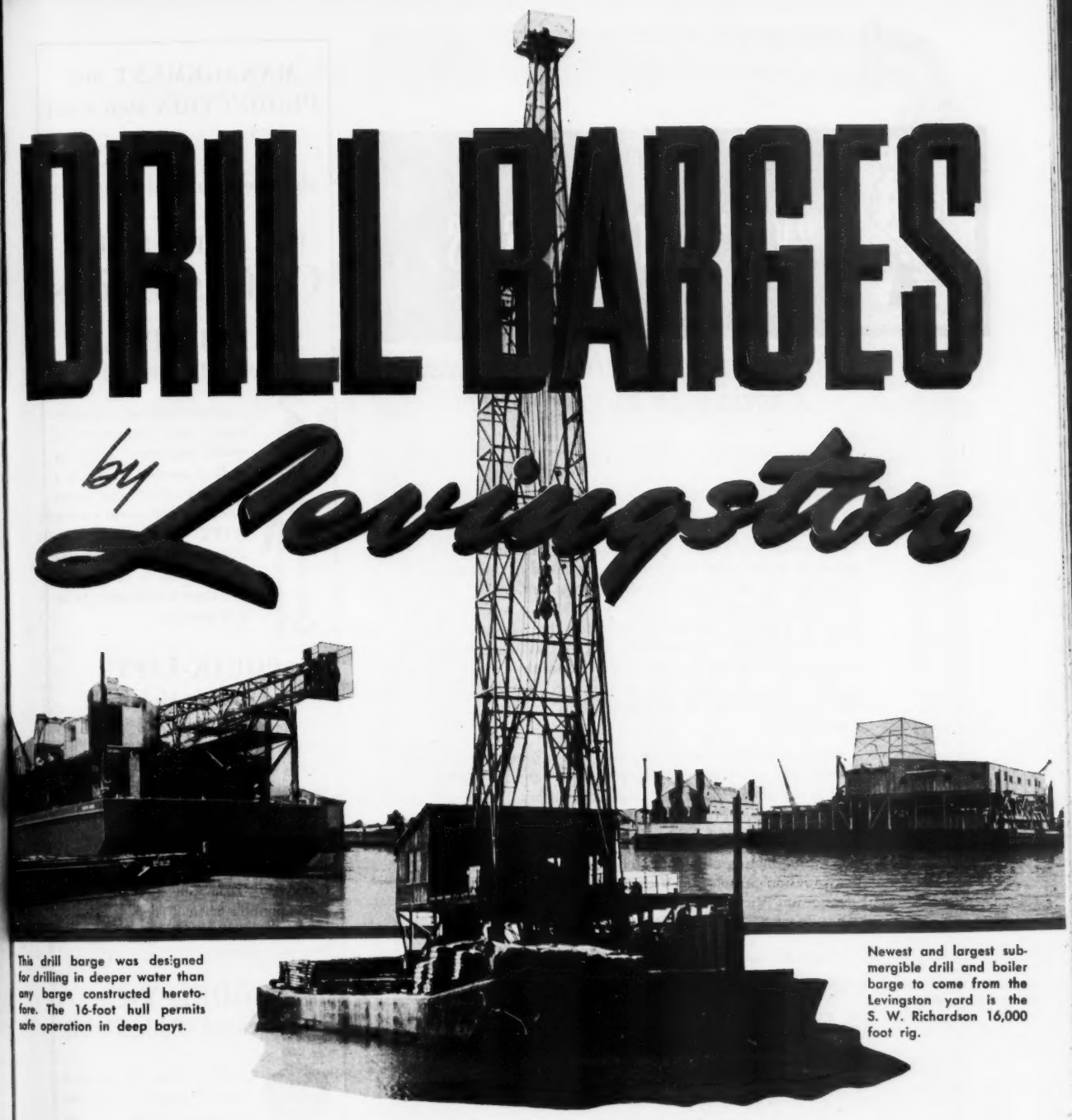


Fig. 2—(Right) New Sid Richardson steam drill barge now drilling 30 miles southeast of New Orleans. This barge was built to Richardson specifications by Levingston Shipbuilding Co. at Orange, Tex.

DRILL BARGES

by Levingston



This drill barge was designed for drilling in deeper water than any barge constructed heretofore. The 16-foot hull permits safe operation in deep bays.

Newest and largest submergible drill and boiler barge to come from the Levingston yard is the S. W. Richardson 16,000 foot rig.

This well servicing, or work-over, barge was built for a major oil company for operations on the Louisiana coast.

For many years Levingston has specialized in "custom-built" vessels. Before the war it was tugs and barges, most of which were built to customer's specifications. During the war it was rescue tugs, "vest pocket" tankers for running fuel onto shallow beach heads, derrick lighters and similar craft that were as urgently needed as other vessels but whose unconventional design posed a production problem for the larger shipyards.

Since the war, Levingston has entered another highly specialized field of marine construction . . . submergible drilling barges and such auxiliary equipment as boiler barges, water and oil barges, supply barges and tugs. The conversion of decommissioned naval vessels to craft for off-shore oil operations is still another phase of Levingston activity.

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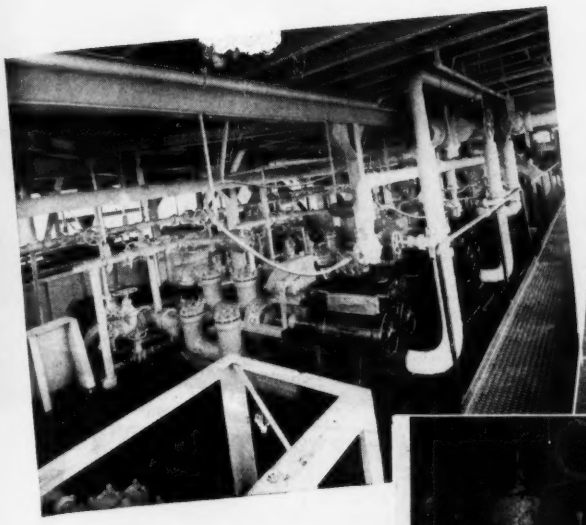


Fig. 3—(Above) Mud-pumping equipment located on main deck with mud pit at extreme left

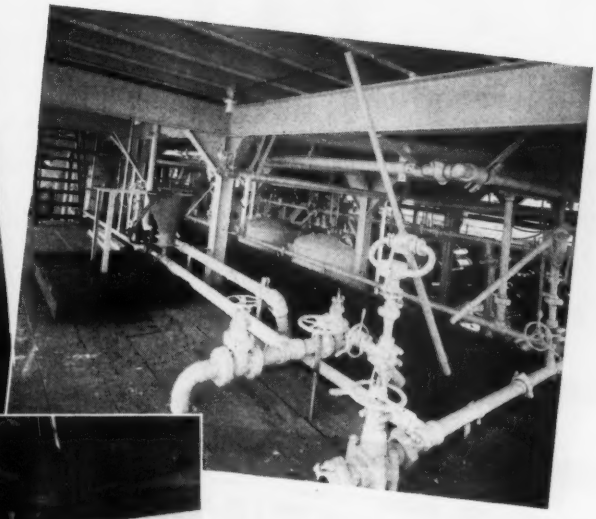


Fig. 4—View showing mud pit, mixing hopper, and mud gun. Thornhill-Craver Unibolt fittings were used throughout both barges

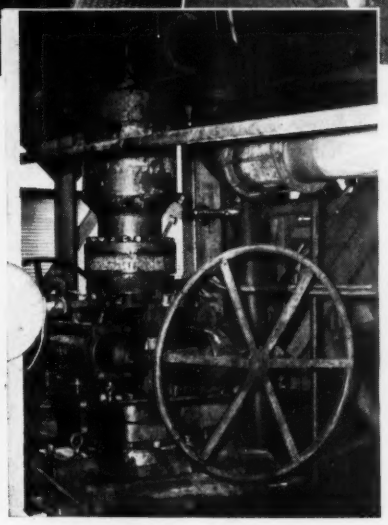


Fig. 5—Pressure-control equipment on well now being drilled by Sid Richardson consists of Cameron and Hydril

draw works is powered by a 14 by 14-in. Ideal engine. This engine structure is bolted to a skid under the draw works, and the bolt holes are slotted so that the whole engine may be jacked back to take up slack in the chain to the draw works which may be too small to justify the removal of a link.

On many rigs the release line from the hydromatic brake to the hydraulic tank normally goes over the top of the draw works, and is sometimes in the way of the floor men. During the construction of the barge, arrangements were made to run hydromatic lines below the draw works. The automatic cathead beside driller is equipped with foot control so that the driller can make up his own pipe.

Also on the upper deck is an American Locomotive coring drum powered by a No. 7 Oil Well upright engine. To the right of the driller's position are dual, swivel-type bug blowers which sweep across the position of roughnecks and drillers during trip operations.

The portion of the operating house on the upper deck (Fig. 1) immediately behind the draw works (oak floored) is spacious and one side is divided into a number of rooms. There is an office complete with a ship-to-shore 75-watt R.C.A. marine radio, file cabinets, ship clock, and maps of the active area. Those licensed to use the radio in this office are drillers, derrick men, tool pusher, and engineers. A loud speaker from the radio is located near the driller's position to enable him to hear his call above the noise of drilling operations. The tile lavatory, stainless-steel galley equipped with electric refrigeration, insulated superintendent's quarters, and crew sleeping quarters located on this portion of the barge are of the finest type ever incorporated into barge design.

In Fig. 1 it will be noted that a mud-storage room occupies a large portion of the space at one side of the upper deck. The platform at the upper end of the conveyor is hinged so that it may be folded back against the side of the barge when the latter must be taken through locks. Guard rail on the platform may be easily removed.

Fig. 1 also shows the location of major items of equipment on the main deck. Mud-pumping equipment

(Continued on page 226)

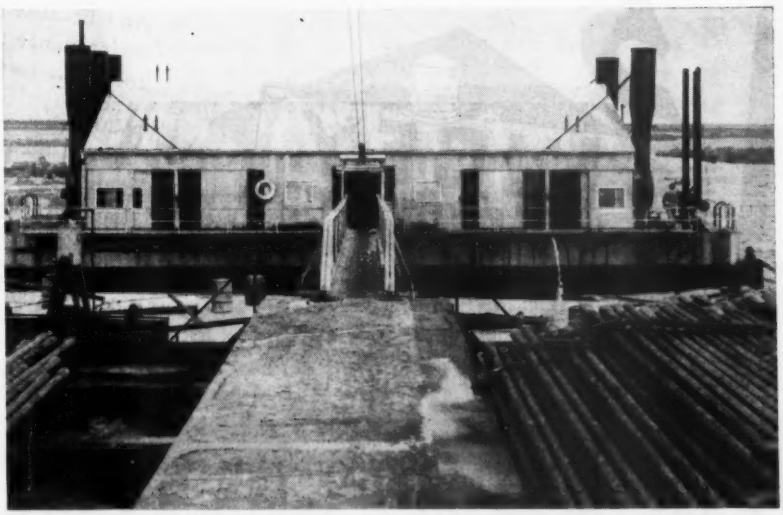
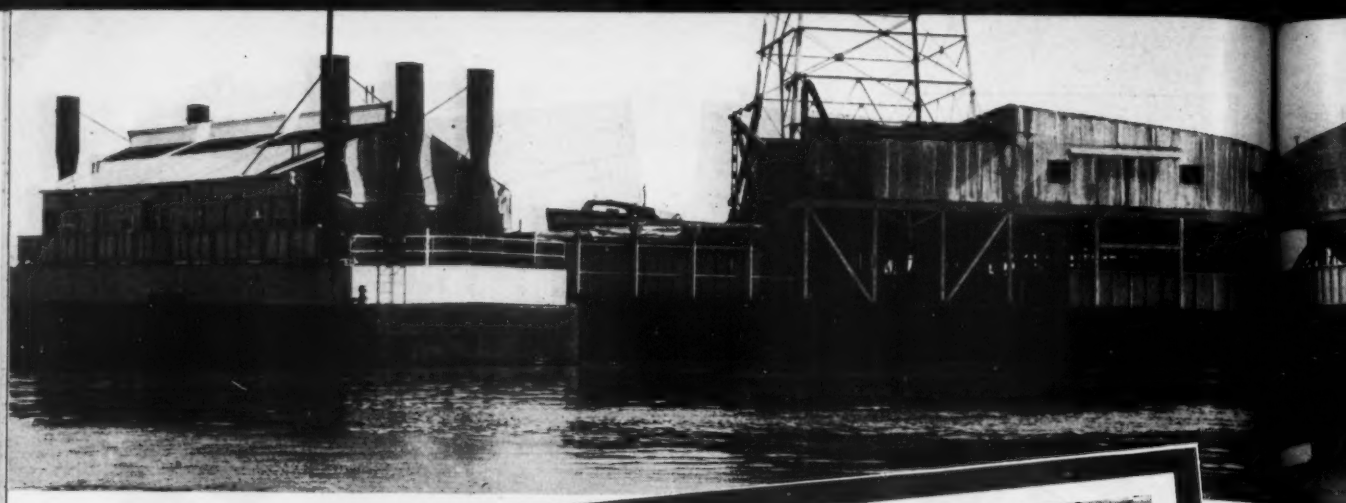
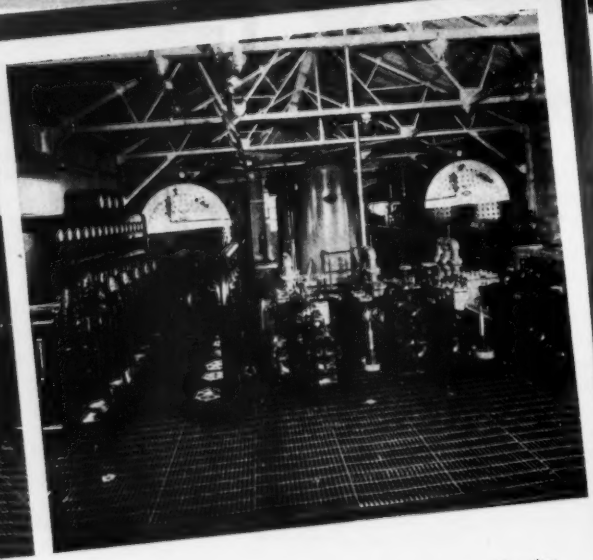


Fig. 6—View of five-boiler barge from derrick floor of drill barge. An 86-to-1 hand winch located on the back side of the drill barge is used to pick up bridge. Line from winch goes over top of derrick to far end of walkway. A 6-in. steam line from the boiler barge to drill barge equipped with ball joints, is supported by bridge. Return line from condenser units is also supported by bridge





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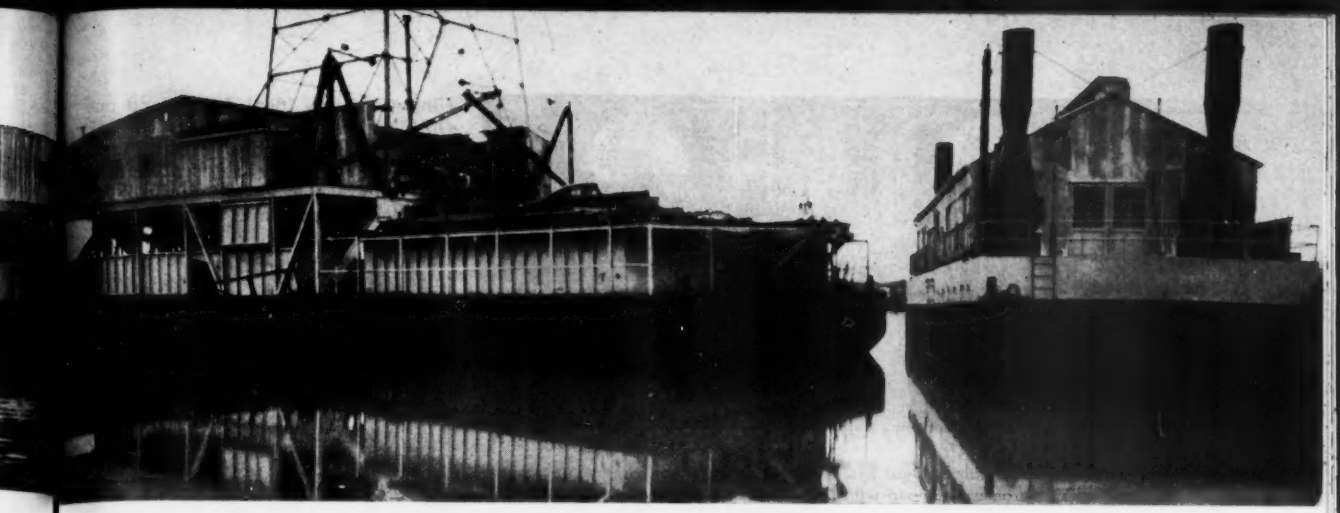

Adventures ON A DRILLING-BARGE FLEET — *by* HUCK FINN

Boy, is this something! Tarpon off the starboard—good food in the galley—buried treasure below—OIL!

Me and Tom and the crew will sure have fun. Me and Tom is bunk-mates. No corn shucks for us this trip! Beds as soft as white clouds, 'lectric lights and fans and lots of things we didn't have when we sailed the Mississippi.

And have we got the machinery! The driller says we can dig a hole to China, if necessary. All the power for this stuff comes from the boiler barge, equipped with five big babies made by Lucey. There ought to be some racket around here when the machinery gets going' and those five big Lucey boilers start fryin' and poppin' off.

Me and Tom is eager to put out to sea. Got the fanciest office you ever seen. Radio, telephone and everything. Watch for us in the news, folks; we're going out to make oil history!

• • •

Like lots of other good oil country equipment, Huck, those Lucey boilers came from Jones & Laughlin Supply Company. They are fine, easy steamers, those Luceys, typical of the quality equipment we handle for every oil country need.

This drilling barge plant is the property of S. W. Richardson, Ft. Worth, Texas, and is being used for deep drilling operations off the Gulf Coast. The entire plant is in charge of C. E. Ratcliff, Marine Drilling Superintendent, operating under direction of J. E. Hill, General Manager of Drilling and Production.

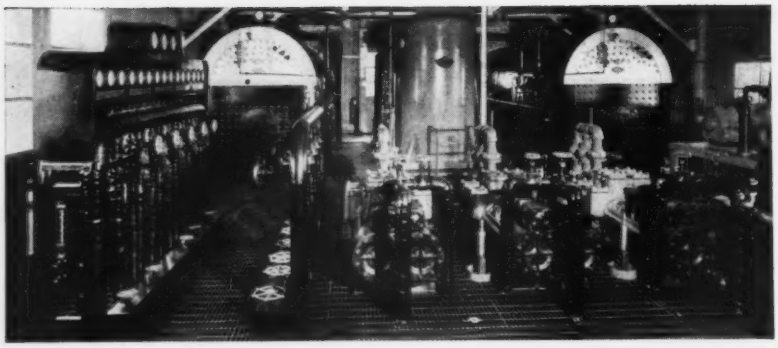

Fig. 7—Interior view of boiler barge. Dual Zeolite water softeners and filters are located between the two boilers. Barge is equipped with Inferno automatic firing control equipment

consists of two Ideal duplex and one Oil Well triplex. Dual 145 NRM Link Belt shale shakers on the center side of the main deck are located over dual sand traps. One sand trap can be washed out while mud is going through the other. A specially designed railed walkway (which can be folded back when barge is being moved) is located directly over the shale shakers. Condenser equipment located at the pump end of the main deck consists of two American Locomotive units, either one of which will take care of pumps and drilling engine while the other one is being repaired.

Blowout-preventer equipment consists of 10-in. Cameron and Hydril as shown in Fig. 3. A 10 by 5 by 10-in. pump installed on the main deck unit is capable of putting up 700 psi. for blowout-preventer operation. However, connections are such that one of the 20-in. mud pumps can be used if necessary.

Installations which contribute either to the efficiency of the drilling rig, or to safety, are located on this portion of the barge. The tong weights operate in 10-in. guide pipes which eliminate any hazard to those working in these quarters. There is an overhead track and chain hoist which facilitates the installation and tearing down of blowout preventer.

Covering the slot in the barge is a hinged floor which can be swung up when the barge is moved away from the well location. During drilling operations, welding equipment, spare steel for repairs, bits, rope, cable, oxygen, and acetylene are stored on the slot floor. In addition to this space, four 8-by-12-ft. supply rooms have been incorporated into the design of the main deck. These rooms are used for welder supplies, fittings, auxiliary 15-kw. generator driven by a Waukesha engine, and paint.

The Boiler Barge

Upon the boiler barge are installed five 150-hp. Lucey boilers. These are equipped with plastic duck's nests, burner equipment which will handle either fuel or oil, and Owen Tool Co. fan-type blowers. The blowers are driven by steam turbines which maintain a pressure of 5 to 6 oz. in the fire boxes; in other words forced draft when using oil for firing.

All valves on the boiler header system are labeled, e.g. fuel oil, fresh water, etc. The blow-down valve control is located in front so that the glass can be watched during the operation. Pumping equipment consists of four 10-by-5-in. pumps and three gear-type pumps—the latter being used when firing with oil. Fuel oil is carried on the barge at all times as an emergency measure in event of a failure in the gas

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supply. The steam exhausts from pumping equipment are directed through the hot tank in order to raise the temperature of boiler feed water. When fuel oil is used, it is preheated by exhaust steam.

The walkway along the back side of the boiler barge is hinged so that it may be laid back against the barge during movement through narrow waterways.

Equipped with Bug Blower

Pull string for manipulating stuck pop valves are conveniently located on the walkway. Gutters on both the boiler barge and drilling barge are connected to the fresh-water storage tank. This barge is equipped with a Garrott swivel-type bug blower. Both the boiler barge and the drill barge are piped with air lines having connections at frequent intervals for the use of paint guns, winches, B. & J. air slips, buffers, and grinders.

One of the most useful items of equipment designed for the prevention of galled tool-joint threads is being used in the drilling of this well. This device, manufactured by Owen Tool Co., was designed by Ratcliff. In picking up a single from the mouse hole with the kelly it is practically impossible to prevent the kelly from swinging out of line with the single. This operation ordinarily results in either lost time incurred by having to pick up the kelly and restabbing, or galled tool joints. The Ratcliff device consists of a steel bowl with a revolving center piece welded to a heavy steel spring. This is dropped to the bottom of the mouse hole. When a single is placed in the mouse hole its weight is carried on the spring. The kelly, therefore, remains in perfect alignment when being stabbed and made onto the top of the single.

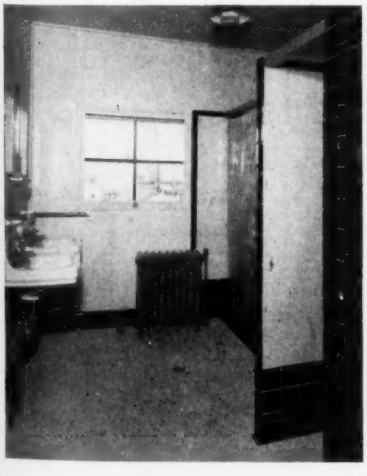

Fig. 8—Steam-heated tile-floor lavatory and shower

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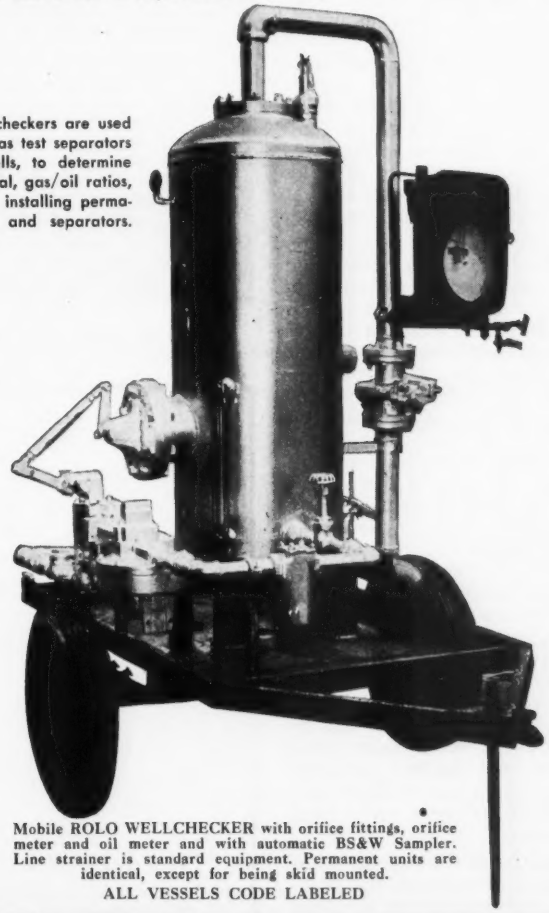

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Offshore Development in Gulf Coast Promises To Be Well Under Way by End of 1947

Many Engineering Problems Still to Be Solved

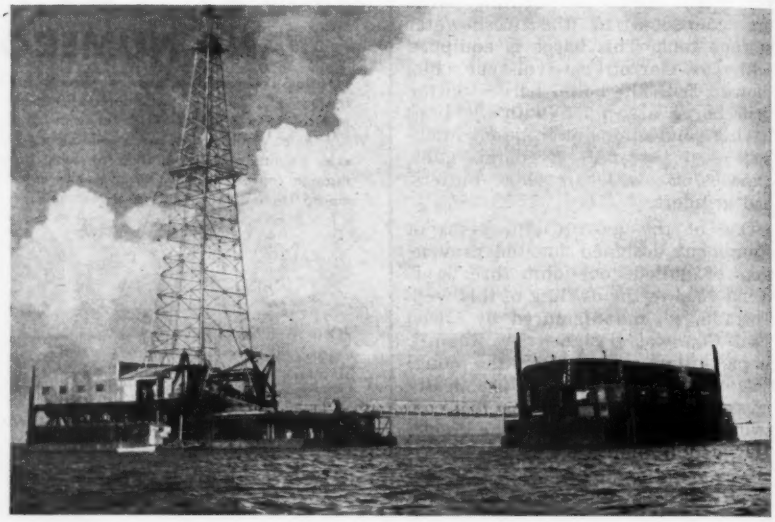
by E. H. Short, Jr.

OFFSHORE development in the Gulf of Mexico, predicted by many operators long before extensive developments of inland bays and shore-line locations was begun in the early 1930s, promises to be well under way by the close of 1947. Magnolia Petroleum Co., first to invade the distant offshore hurricane-swept waters of the open Gulf, completed its steel island location in August 1946, 10 miles outside Atchafalaya Bay, Louisiana. Magnolia is now completing another platform in Block 94 at a location approximately 29 miles out in the Gulf, and southwest of their present location near Point Au Fer.

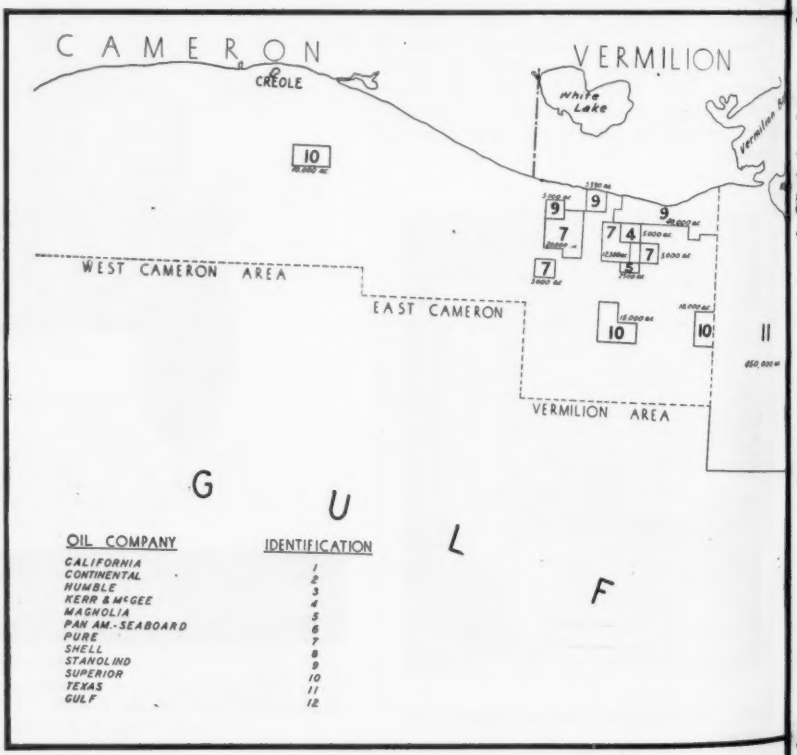
A great deal has already been said concerning the possible existence of tremendous oil reserves on the Continental Shelf which extends out to points in the Gulf where the water depth increases abruptly from approximately 600 ft. to roughtly 1,200 ft. The edge of the Continental Shelf lies only 15 or 20 miles south of the Mississippi Delta. However, from this point on around toward Texas, the distance of the shelf edge from shore gradually widens until it reaches a maximum offshore distance of over 130 miles south of Cameron, La. Speculation of the oil possibilities which might lie in areas such great distances offshore, under turbulent waters 600 ft. in depth, may be interesting; however, the involved engineering problems which must be surmounted before such areas can be drilled (provided such possibilities would bear up under economic scrutiny) precludes any serious consideration at all, at the present stage of development.

Unless accelerated by some near future national emergency, the probable rate of development in the Gulf of Mexico may be charted roughly by a consideration of development trends from the time the first water operations were begun on the Gulf Coast.

Many of the most important fields of coastal Louisiana have been located offshore in bays, lakes, and other water beds. Starting as early



Modern diesel-electric drilling-barge rig operating in one of Coastal Louisiana's bays

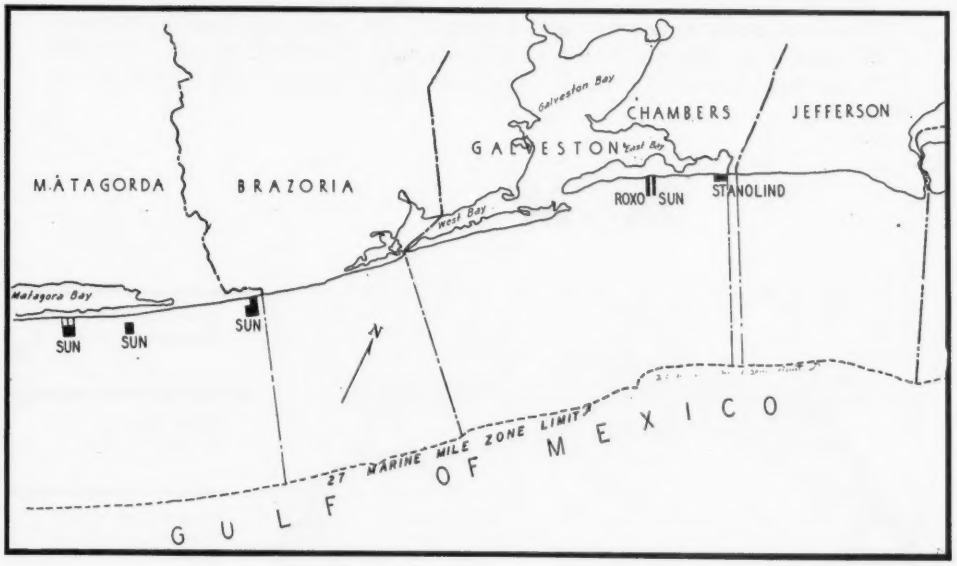


as 1929 and 1930 when The Texas Co. opened a group of fields in the open waters and bordering marshes of Terrebonne Bay, a large part of the exploration and development in this district has been in water-bed and marsh-located areas. While some of the drilling has been done in water up to depths of 10 and 12 ft. and in places where bays open out into the Gulf of Mexico proper, most of these areas in the past have been regarded as sheltered or semiprotected from storms and high waves or swells.

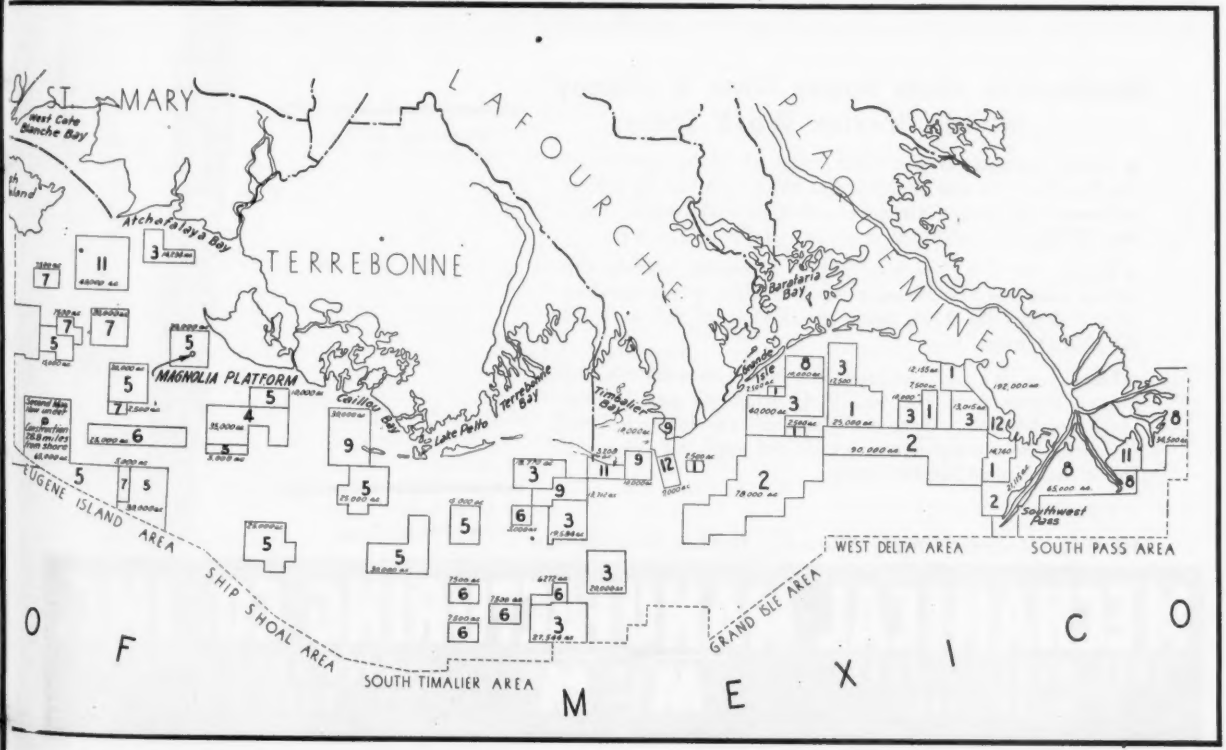
Approximately 10 years have elapsed from the time the first well was drilled in the Gulf proper to the present date of the Magnolia Point Au Fer project. The first offshore well was that of Superior Oil Co. and Pure Oil Co. which was located over a mile out in the Gulf at a point southeast of Cameron, La. The water at this location was approximately 13 ft. deep at mean low tide. Ten wells were eventually drilled from the one platform in bringing in what is now known as Creole field.

During the first part of 1938, the extensive exploitation of oil possibilities of the Gulf of Mexico and bays along the Texas coast was begun. Standard Oil Co. of Texas and Salt Dome 1 State, about a mile offshore from Cedar Point in Galveston Bay, brought in during February 1938, marked the beginning of development in large bay areas of Texas. Also during this year, I. E. Harwell and associates brought in a well 9 miles southwest of Sabine Pass, Jefferson County, at a location 150 ft. offshore.

At this same time drilling was begun in Laguna Madre, a shallow strip of water between Padre Island and



Right: Blocks under lease in Gulf of Mexico off the Upper Texas Gulf Coast. These are exclusive of blocks under lease in Matagorda and Galveston bays. Below: Blocks under lease in Gulf of Mexico off Louisiana Coast. No attempt has been made to indicate leases held in bays and other state-owned water beds



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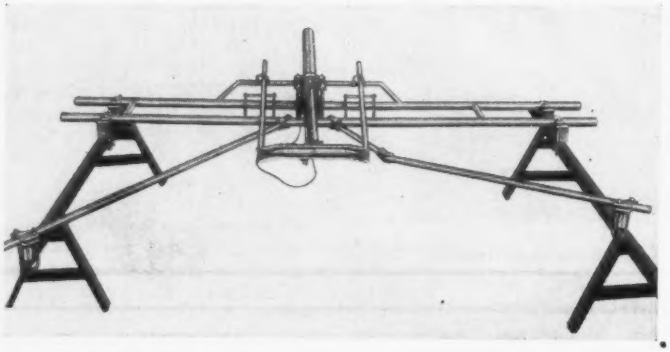

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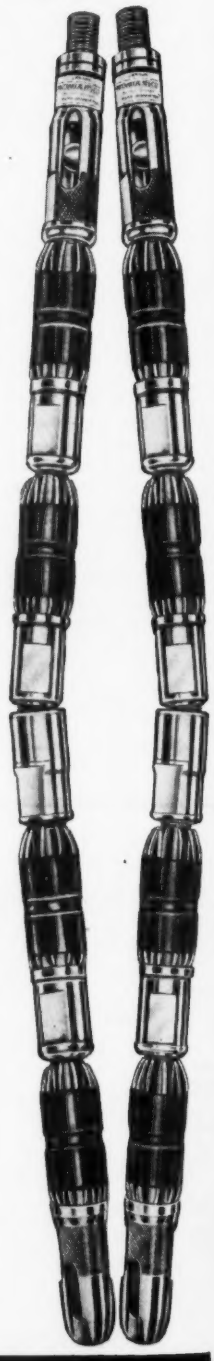

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the mainland, extending from Nueces County, southwestward to the mouth of Rio Grande River. Another offshore venture during this period was that of Humble Oil & Refining Co. 20 miles down the Jefferson County coast. Their operations at that time involved drilling on piling foundations 4,000 ft. offshore. A British-American Oil Producing Co. venture involved drilling 5,000-ft. Miocene wells at a distance of 9,000 ft. off the coast of Jefferson County. At this time (during 1938) all navigable waters, when included all the bays as well as the area offshore out to the 3-mile limit, were owned by the State of Texas. The tracts leased in the Gulf were usually ½ mile wide extending out to the 3-mile limit and consisting of 960 acres.

Early Geophysical Work

Particularly in 1938, during this extensive shore-line development, numerous predictions were made as to the possibilities for some day uncovering huge oil reserves out in the Gulf of Mexico. Despite the reasonable assumptions that a shore line could not be considered a line of demarcation for subsurface conditions conducive to the entrapment of oil, it was almost 5 years before definite steps were taken to conduct extensive geophysical surveys at distant points offshore.

The early geophysical work in the Gulf of Mexico did not extend beyond approximately 3 miles from shore; but in the early part of 1944 Superior extended the frontier of workable seismograph territory in open waters of the Gulf to a distance of 26 miles offshore. Since this time the fleets of the major oil companies have conducted extensive seismic surveys to points over 50 miles from shore. Both reflection and refraction seismograph work has been done and the gravimeter has been brought into play. Considerable geophysical work has also done in the Gulf with the airborne magnetometer.

As to how many structures have been found up to date by the geophysical surveys carried on in the Gulf by these companies is anyone's guess—and a number have been made. Since oil companies do not ordinarily reveal this type of information, the success of their geophysical work can be measured by noting from the accompanying map the extensive lease plays which have been made beyond the 3-mile limit off the coast of Louisiana.

Leasing Thus Far

All leases taken thus far are well on the shore side of the 10-fathom contour; and a great majority of the leases are in shoal areas where the water does not exceed much more than 30 ft. in depth. From a reliable source it has been said that a major company recently acquired a lease at an offshore point where the depth of the water exceeded 100 ft. This, however, has not been verified. While wells have been drilled from piling platforms in water of this depth in Lake Maracaibo, conditions in the Gulf are quite different and it is doubtful if drilling in 100 ft. of water will be attempted before more experience is gained in the shallower depths.

In the leasing of Gulf of Mexico water bottoms, the State of Louisiana offers for bidding, blocks of 5,000 acres each. However, it is permissible for a company to bid on fractional parts of a block. The state royalty amounts to the usual one-eighth of all oil and one-eight of all gas produced. The lessee agrees to drill within 1 year, or to pay rental for the right to defer drilling for a period not to exceed 5 years from the date of the lease.

The lively bidding displayed during a sale held early in May is indicative of the confidence many companies are placing in the results obtained from their geophysical surveys. For several years, at various intervals, Superior's seismic fleet has done extensive work in the offshore area between Cameron and March Island. During the recent sale, Superior paid $171,550 for Block 76, $65,750 for Block 66, and $57,750 for Block 77—a total of $295,050. Stanolind Oil & Gas Co. acquired Block 21 and the west half of Block 5 in the Vermilion area for a cash bonus of $189,513. In the Eugene Island area Texas Co. paid $126,550 for Blocks 26 and 47. Also during this same sale, California Oil Co. purchased the lease on two blocks in the West Delta area at a cost of $156,980.

27-Mile Zone

Recently the State of Texas located a 27-mile zone showing the submerged area to which counties along the Gulf of Mexico are entitled. Water bottoms beyond the 3-mile limit to the 27-mile limit will be offered (where there is sufficient demand) in blocks consisting of 5,760 acres.

While there has been a considerable elapse of time between the early close-to-shore operation in Creole field and the present distant offshore operation begun by Magnolia 5 miles south of Point Au Fer, it appears quite likely that the offshore curve of development will take a sharp upward swing beginning during the latter part of this year. Already the seismic methods are far ahead of the engineering technique still to be developed for meeting distant offshore drilling problems with a minimum outlay of money and a maximum amount of safety against hurricanes and ocean currents. However, the mechanical problems involved in this work are being given intensive study by major oil-company engineers.

While it is generally acknowledged that the first few wells will be drilled from piling platforms, many believe that as experience is gained in this type of project, a more economical and also a quicker method will be worked out, possibly involving the use of a platform fabricated to a desired height and having a submersible base. Investigations are under way at present to discover some practical method of imparting the required stability to the base or hulls of such a structure, since the recoverability feature of such a platform would have an attractive cost advantage over the present piling platforms.

The close of 1947 should see distant offshore development in the Gulf of Mexico well under way. With Magnolia's second platform approximately 29 miles offshore now nearing completion, a number of companies have indicated that their work on offshore platforms will be commenced during the latter part of the year. These companies are: Texas Co., Humble Oil & Refining Co., Stanolind Oil & Gas Co., Superior Oil Co., and Pure Oil Co. Possibly two other companies will be included in this group before the year is out.

BOOKS

SOUTHERN CALIFORNIA METER ASSOCIATION HANDBOOK. Published by the association, obtainable from the association's secretary, 2916 Eucalyptus Avenue, Long Beach 6. 142 pp. $4.75. (Data sheets without binder also obtainable for $3.00).

Measurement engineers will find this handbook a convenient means of referring to metering information either in the office or in the field. It consists of a 5 by 7-in. fabrikoid-covered binder, with the inserted individual pages consisting of loose-leaf tables, charts, drawings, and alignment curves. The material is indexed under the following headings: Metering Coefficients and Correction Factors; Orifice Meters—Gas; Flange Connections; Pipe Connections; Orifice Meters—Steam; Orifice Meters—Liquid; Petroleum Liquids; Orifice Meters—Water; Displacement Meters—Gas; Square Root Orifice Meter Charts; Dimensions of Various Fittings, Flanges; etc.; Orifice Plates, Fittings, and Meter Tubes; Orifice Fittings; Boiler Data; Capacities and Velocities; Physical Constants, etc.; and Miscellaneous Data.

The secretary maintains a register of the purchaser of each handbook and whenever data sheets are revised, the new sheets for such changes are forwarded to the purchaser so that the handbooks may be kept up to date with the latest standards of measurements.

THE INDEPENDENT PETROLEUM COMPANY. United States Printing Office, Washington. 569 pp.

This volume is a report of the hearings before a special Senate committee investigating petroleum resources. It is being distributed by The Committee of the Independent Company, and Independent Petroleum Association of America. The investigation was authorized by a resolution providing for it with respect to petroleum resources in relation to the national welfare. The hearings were held March 19-22, and 27-28, 1946.

Recent Trends in
Directional Drilling
on the Gulf Coast

by W. H. Cook*

Fig. 2—Operation of the whipstock
1—On bottom in oriented position. 2—Pilot hole made. 3—Picking up whipstock. 4—Reaming pilot hole to full gage

Fig. 3—Operation of Eastman full-gage whipstock
1—On bottom in oriented position. 2—Pilot hole made. 3—Picking up whipstock. 4—Drilling ahead with full-gage tools

Fig. 1—(Left, above) Removable whipstock with drag-type whipstock bit

Fig. 4—(Right) Full-gage removable whipstock with rock-type bit

SINCE its spectacular introduction to the Gulf Coast region in 1934,† directional drilling has become a standard procedure whenever mechanical or geological conditions warrant its application.

It is the intent of this article to discuss not the standard tools and practices employed by the companies offering this service, but rather the newer tools and their applications plus a glance into the future of this particular phase of the industry in this area.

One of the most noteworthy features recently introduced in the Gulf Coast regions has been the tendency to drill directional holes at higher average angles from the vertical than was formerly deemed prudent practice under normally encountered conditions. For years in this area typical jobs were conditioned and predicated upon average angles of from 5° to 7° from vertical and envisaged maximum angles of roughly 10.° The latter figure naturally varied in accordance with the total deviated footage to be drilled. One should not construe from this, however, that no wells were drilled at angles greater than those mentioned. On the contrary average angles as high as 45° were successfully carried as early as 1936 in the Gulf Coast to the writer's personal knowledge. Such jobs, however, were unusual, and average angles of from 5° to 7° were much nearer the norm.

Abnormal Vertical Footage

Under those conditions it was necessary to drill what is now generally considered to be an abnormal vertical footage in order to effect the desired horizontal deviation on bottom. The fact that most controlled directional drilling in this section is done on or around piercement-type dome structures whereupon definite drift tendencies in holes drilled are ordinarily encountered, also contributed to the detriment of the aforementioned practice in the following fashion. In those cases wherein the desired direction of the drift more or less coincided with the natural drift tendency no obstacles were presented, but whenever the two azimuths grossly conflicted, the holes had definite tendency to turn toward the direction of natural drift. This of course occasioned the frequent setting of directional-drilling tools in order to maintain the deviated holes along their desired course.

Both of these features, being highly consumptive of rig time, were and are the object of much scrutiny on the part of the oil-operating as well as the controlled-directional-drilling companies. Since practically all parties agreed that increased angles would present no undue operational

*Eastman Oil Well Survey Co.

†The Oil and Gas Journal, January 18, 1934.

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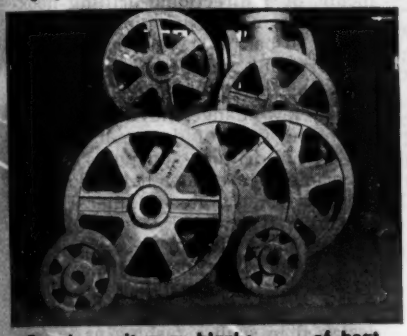
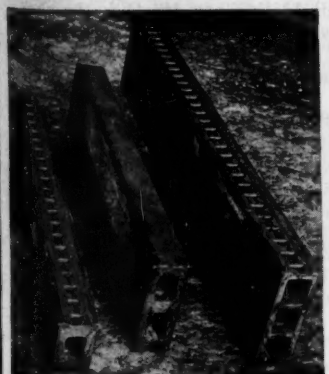
Fluid end of mud pump . . . an intricate high pressure casting

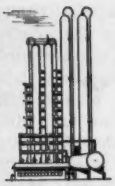


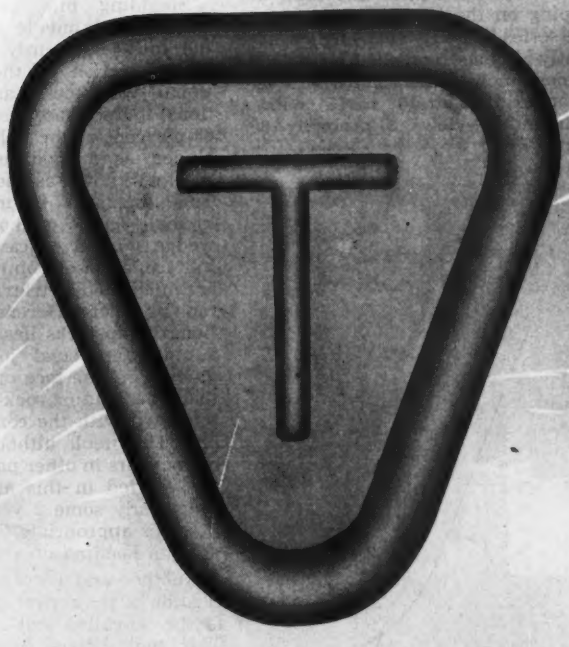
Pumping unit gear blanks . . . of heat treated alloy steel

High pressure well head castings . . . insure safe control



Refining heat exchanger castings sound and true to pattern





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difficulties, provided that the angles were introduced at a proper mechanical rate, and at the same time would decrease the required amount of vertical footage; and since it had been observed from the occasional experiences with higher-angled holes that such holes had a greater tendency toward stability in direction, a general upward revision of the angles to be carried in controlled directionally drilled wells has been observed.

Incidentally the characteristic of greater stability in direction inherent in holes of higher angle was further substantiated by the known fact that the amount of turn which can be induced in a hole by mechanical means, i.e. directional drilling tools, varies inversely with the amount of angle from the vertical present at the depth of the proposed tool setting. This trend, while consistent, has not been spectacular, but rather has been developing on the basis of experiments with series of wells each drilled at a slightly higher angle. The typical prognosis now contemplates an average angle of from 10° to 15° with a maximum in view of probably 20° more or less.

This of course does not compare very favorably with some other sections of the country, notably the Pacific Coast, where wells drilled at an average angle of 45° are in some areas so-called "run of the mill" jobs, and where wells with a maximum of over 80° from the vertical have been successfully completed. It is generally doubted that such records as the latter will ever be attained in this sector due to the instability of the formations normally encountered in drilling operations in the area. However, a general upward trend in proposed angles has been noted, and, since mud control, drilling equipment, and all affiliated phases of the drilling industry daily are being upgraded, it will be interesting to observe the optimum effort.

New Equipment

Spudding bits, removable whipstocks, and knuckle joints are by far the most frequently employed tools in this section. Of the three, conventional whipstocks and/or modifications thereof, are used on probably 80 per cent of the holes deviated. Included as a modified whipstock is the tool known as the knuckle guide. This inclusion is made since the knuckle guide embodies a tapered wedge with a concave groove down its face, a chisel point on bottom, and an integrated retrieving ring at the top. Its chief difference from conventional whipstocks lies in the fact that a small universal joint is used in drilling off the face of the tool rather than the drag or rock-type whipstock bits used with the conventional models. This tool, although in use for many years in other parts of the country, started in this area in quantity usage only some 2 years ago. Hence it seems appropriate to include it under the heading of new equipment.

Another and very promising modification of the conventional whipstock is the so-called full-gage whipstock. This tool differs from the conventional design in that the retrieving ring is larger and the concave groove which extends completely to the chisel-pointed bottom, is deeper. Reference to Figs. 1 and 2 will clear up any ambiguity which may exist as to the differences between the two tools. The full-gage whipstock is modified for use with drilling bits larger than those used with conventional removable whipstocks. The hole drilled by the full-gage whipstock bit is only slightly smaller than the well bore itself. Thus it is possible to follow this tool with a conventional full-gage drilling setup, thereby eliminating the necessity of the extra trip normally made after the setting of a tool for the purpose of reaming the pilot or rat hole to full gage. The time-saving factor of this feature of the tool as illustrated by Figs. 3 and 4 is obvious.

Another but more concealed advantage is that the bits used are screwed directly to 4½-in. pipe. This eliminates the necessity of the 3½-in. double or single normally used with conventional tools and of course avoids the possibility of bending or kinking. It is also generally conceded that through usage of 4½-in. drill pipe which is admittedly stiffer than 3½-in., the angle which can be introduced into a hole by means of this tool is more in the nature of a gentle curve rather than the abrupt angular change which can be effected by means of a directional-drilling hookup employing 3½-in. pipe. Thus the danger of bad "dog legs" in a hole and the resultant mechanical trouble thus occasioned is minimized.

Very few changes have been effected in the field of design of bits for directional-drilling purposes. Joint experiments are now being conducted, however, by Reed Roller Bit Co. in conjunction with Eastman Oil Well Survey Co. which, if successful, will prove to be a definite contribution to the science of controlled directional drilling and surveying. This bit is designed in such a fashion as to permit the drilling of full-gage hole without the use of a retrievable plug-center bit, and at the same time offers an avenue of protusion for a typical inside single-shot directional-surveying instrument assembly. By virtue of this latter characteristic it is possible to obtain a single-shot reading in the open hole without removing the drill pipe.

Construction of Bit

This bit (Fig. 5) is of a modified welded-in blade fishtail design. It embodies an opening or void through its central axis to permit the passage of an inside single-shot barrel. Mounted in recesses at right angles to the two fishtail blades are two core-breaker blades which can pivot through an arc of 90° about the pins which transfix them. When closed, these blades serve to break the core which the bit would normally cut. When open, they permit egress of an inside single-shot assembly into the open hole. By means of a pilot assembly, retrievable in a fashion similar to that employed with wire-line coring equipment, this bit can be used as a pilot reamer to ream to full gage the rat holes drilled with conventional directional-drilling tools. Herein lies an important time-saving feature of this bit. After the

Fig. 5 — New experimental design for a directional drilling bit, designed to drill a full-gage hole without use of a retrievable plug-center bit. A hole is provided through bit for a single-shot directional-surveying instrument

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rat hole has been reamed and its mechanical angle and direction determined by means of an inside single-shot reading, the drilling of full-gage hole can be resumed immediately. This eliminates the necessity of the round trip normally at this stage to exchange the pilot bit for a typical fishtail or rock bit. Additional checks on the angle and direction of the hole can be made during this drilling time simply by lowering an inside single-shot instrument down through the drill stem on a wire line until it is positioned in and protruding through the bit, thereby recording the angle and direction of the hole at that point. Similarly, if, after the rat hole has been reamed to full gage, the inside single-shot reading indicates the necessity of setting another tool, the bottom of the hole can be squared with the Reed bit. After this, the drill pipe is removed from the hole, and another run made with the conventional directional drilling tool in use.

Importance of this factor is that since all directional-drilling tools are designed for setting in square-bottomed holes, and since it is obviously impossible to ream a hole to full gage completely to bottom with a conventional pilot reamer, it is necessary to make an extra round trip with the drill stem for bottom-squaring purposes when a conventional pilot reamer or hole opener has been used. Thus, regardless of the results realized from conventional directional-tool settings, whenever the reaming run is made with this special bit, a complete trip with the drill pipe is automatically eliminated.

The bit may also be used to advantage with full-gage directional-drilling tools. As an example of this the writer is reminded of a controlled directional drilling job recently completed in the Gulf Coast. The well in question was projected to a depth of 8,200 ft. and a horizontal deviation of from 400 to 450 ft. on bottom was desired. The contractor drilled the hole by routine methods to approximately 5,400 ft. At this point a directional survey was made to determine bottom-hole location. An inclination of 2° in a direction removed by 120° from the desired azimuth of closure of the proposed 8,200-ft. bottom-hole location was found at the then total depth of 5,400 ft.

Frequent Checks Made

A full-gage whipstock was then set, drilled off, and removed from the hole. The open-hole single shot indicated an inclination of 0°, 45′ and that the direction had been changed the desired 120.° The following run was made with a special Reed bit. Frequent checks were made during the progress of drilling with this bit by means of an inside single-shot instrument as previously outlined. After slightly more than 400 ft. of hole had been drilled, it was found that an angle of approximately 12° had been attained and that the direction remained unchanged. At that time the pipe was removed from the hole and drilling was resumed with the long drill collars and a conventional bit. Since, in view of the angle present in the hole and the stiff drilling hookup in use, it was felt that no abrupt changes in either angle or direction would occur, this bit was left in the hole until dulled. When the pipe was removed, open-hole single-shot readings indicated no material changes. Another bit was dulled, with the same results. In this fashion the well was drilled to bottom. Aggregate single-shot readings defined the bottom-hole location as being slightly over 420 ft. removed in the desired direction from the rotary. Total drilling time from surface to 8,200 ft. on this well was 23 days including 2 days lost when pipe was stuck in a bridge slightly below the surface casing. Average straight-hole drilling time in the same field ranges from 16 to 17 days.

Subsequent tests with this bit in varying types of formation have indicated the necessity of modifications designed to increase its rate of penetration, particularly in sticky shale sections. Experiments along these lines are in progress, and definite improvement has been effected.

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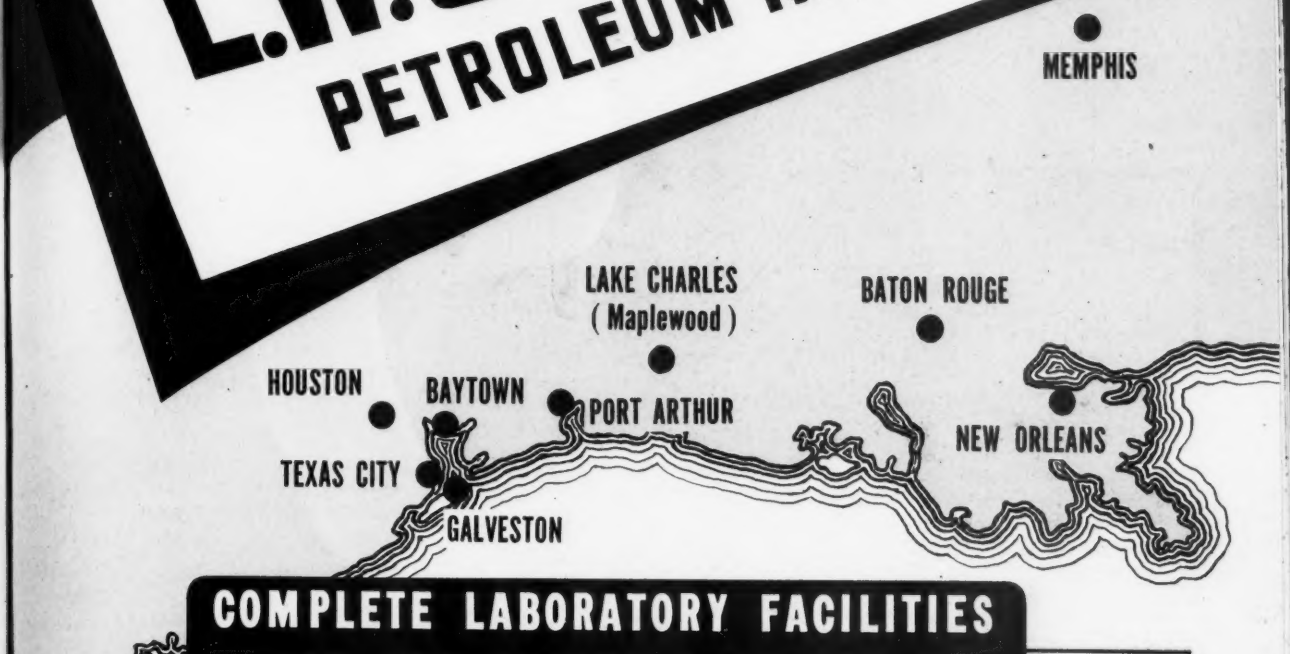

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Nonmagnetic drill collars are another innovation in this area which has won wide acceptance. Their applications in conjunction with directional drilling and surveying work are obvious and well recognized. However, and in view of the comprehensive article* recently published on this subject, it is felt that little should be contributed by another detailed discussion of these collars at this time.

Much interest has recently been manifested in the proposed marine-drilling campaigns contemplated for the possibly oil-bearing structures known to exist beneath the coastal waters of Texas and Louisiana. Due to the depth of the water, current barge-drilling equipment cannot be used in most cases. Therefore, most of the companies are going ahead with plans for the construction of drilling platforms of various design. Due to the exceedingly high cost of such structures, their size is planned so as to permit the drilling of several wells from each platform.

The willingness of the oil-operating companies to go ahead with these plans is a direct challenge to the directional-drilling service companies, and one which is accepted. Much money is being spent by the latter upon research designed to increase their efficiency in the operational rendition of this service. Concrete gains can already be claimed along these lines and other equally desirable improvements will follow.

It is the writer's firm belief that, within the immediate future, dozens of wells, some of whose bottom-hole locations shall be removed by distances exceeding 1 mile from their point of origin, will be drilled from individual platforms as a routine matter of field development. It is also felt that full-gage directional-drilling tools and affiliated equipment will be used to effect the greater portion of this work which will be done at angles higher than any ever before attempted on a large scale in the Gulf Coast. Meanwhile, it behooves all directional-drilling engineers to break out their nautical clothes, because most of us are going to sea.

*Oil Weekly, January 20 and 27, 1947.

Special Muds

(Continued from page 145)

justed to 13.8 lb. per gal. No more Impermex was added. After the mud in the system had become equalized, a sample had a filtration of 5.4 cc. Drill pipe was pulled and casing was run to 11,700 ft., the depth desired.

Drilling High-Pressure Salt-Water Sands

Salt-water flows do not always come as a complete surprise. Previous exploratory wells in an area may have established the depth of salt-water bearing sands. In the Gulf Coast, it has been noted that the salt concentration in the mud filtrate shows a greater than normal rate of increase while drilling the shale section overlying the sand carrying salt water under abnormal pressure. If ordinary mud is being used, control of mud properties becomes progressively more difficult. As the sand section is penetrated, an influx of salt water occurs unless the hydrostatic head of the mud column exceeds the pressure of the salt water. Even if the mud weight is adequate, the swabbing action resulting from withdrawal of the drill pipe may result in the entrainment of sufficient salt water to bring about a marked increase in gels and filtration, and the cumulative effects may be such as to cause the hole to be abandoned.

Such was the experience of an operator in a Louisiana field, who was forced to abandon two attempts to explore the possibilities of deeper production. Mud weighing over 16 lb. per gal. was required to control the salt-water flow and inability to control the other properties of the mud resulted in stuck drill pipe.

On the third attempt, it was decided that a high-pH-Impermex mud

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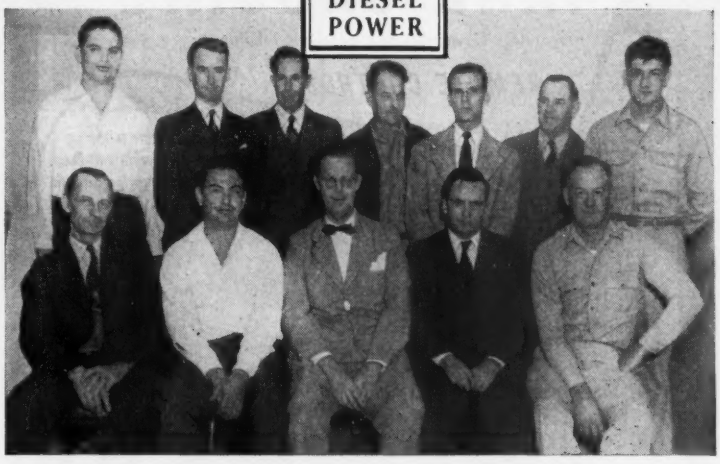

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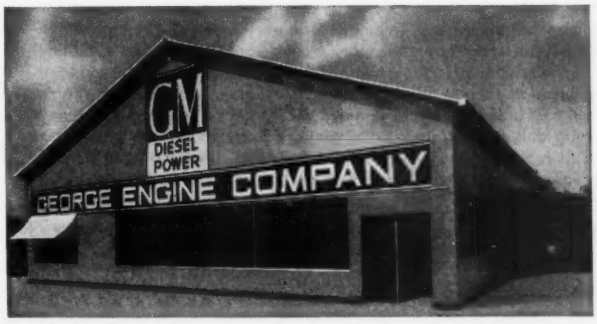

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would be used in order to satisfy the requirements of high weight, low viscosity and gels, low filtration, thin filter cake, and ability to tolerate a marked increase in salt concentration without serious change in properties.

Tests on a sample of the mud indicated that the addition of 0.2 bbl. of water; 3 lb. of caustic soda; 3 lb. of quebracho; 1.5 lb. of hydrated lime, and 6 lb. of Impermex per barrel of mud, along with enough Baroid to raise the weight to 17 lb. per gal., would result in a mud having a viscosity of 58 seconds A.P.I.; initial gel of 2 g. and 10 minutes gel of 10 g.; water loss of 1.5 cc., and a cake 1/32 in. thick.

After 7-in. casing had been set at 9,800 ft., the mud was treated in accordance with the formula previously tested, except for the increase in weight. After drilling was resumed, and the weight had been raised to 15.3 lb. per gal., some mud was lost to the formation. Cement was squeezed in the open hole. Weight was raised to 16 lb. per gal., at which density the mud was maintained until the salt-water-bearing sand was encountered. Returns were lost then and, after reducing the weight and adding materials to combat loss of mud, drilling was continued with mud having an average weight of 15.9 lb. per gal. There was a gradual increase in salt concentration, from 520 to 30,000 p.p.m., as may be seen in Fig. 2, which shows the properties of the mud during the period Impermex was used.

Electrical surveys were made at intervals of 500 ft. On the survey made at 12,000 ft., the electrode twice hung in a key seat at 9,950 ft.; the line parted both times, and the electrode was recovered on both occasions without difficulty.

Drilling continued to 12,247 ft. Drill pipe was stuck in the key seat at 9,950 ft. The hole was cleaned to the bottom of the casing, a plug was set and the well was completed in an upper sand.

In spite of the increase in salt concentration, satisfactory control of mud properties was maintained at all times. In drilling 2,447 ft. of 6-in. hole the average cost of all mud materials per foot was $4.50. A considerable saving in mud materials resulted from the use of a mud which was but little affected by salt water.

Avoiding Trouble From Caving Shale

Before drilling was begun on a deep wildcat test, it was decided to core all sand sections and test those which might be productive. To avoid troubles from caving shales which had plagued earlier attempts to explore the section and to secure the most reliable information possible from core analyses and drill-stem tests, the use of a mud of superior wall-building qualities was essential. Stability and ease of control of mud properties were factors of primary importance since the low water-loss mud would be in use while drilling at least 5,000 ft. High pH Impermex mud seemed most likely to satisfy all of the requirements.

A number of tests were made on the mud to determine the optimum quantities of caustic soda, quebracho, and water to be added to make the base mud. It appeared that a suitable composition would be 800 bbl. of native mud; 200 bbl. of water; 2,000 lb. of caustic soda, and 1,250 lb. of quebracho.

Impermex was added to a sample having this composition with the results shown in Fig. 3. Since slightly lower water loss was expected under field conditions, it was believed that 8 lb. of Impermex per barrel of mud would be satisfactory.

Without interrupting the normal course of drilling, the mud in use was converted to a high pH, lower-loss mud. By the time coring depth was reached, the mud had a pH of 12 and water loss of 2.4 cc.

As drilling progressed, the mud weight was increased from time to time until it reached 12.3 lb. per gal. Viscosity and gels varied somewhat, particularly during periods of continuous coring. In general, the funnel viscosity was about 45 seconds A.P.I., initial gel was 2 g.; 10-minute

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gel was about 40 g., and water loss was kept at about 3 cc. by the regular addition of Impermex. With increasing depth, the temperature of the mud became higher (170° at the flow line) and fermentation was prevented at lower pH.

Drilling proceeded without difficulty. At one time operations were suspended for a week. No trouble was experienced in going back to the bottom when drilling was resumed. Impermex mud was used in drilling from 5,400 to 12,011 ft. Open hole amounted to 8,050 ft. One hundred and twelve cores were cut. Nine electrical logs and five drill-stem test were made.

Materials used in preparation of Impermex mud and maintenance for 126 days were: Caustic soda 10 tons, quebracho 5.5 tons, Impermex 30 tons, and Baroid 370 tons.

Use of Brackish Makeup Water

An example of the use of Impermex in brackish water is afforded by a well drilled in a South Texas field. The nearest source of fresh water was about 5 miles across country or 12 miles by road, while an ample supply of salty water was available from a well on an adjoining lease. The analysis of this water is given in Table 1.

TABLE 1—ANALYSIS OF MAKEUP WATER, SOUTH TEXAS WELL

	Equivalents per million	Parts per million
Carbonate, CO_3	0.1	4
Bicarbonate, HCO_3	2.1	126
Sulfate, SO_4	89.9	4,320
Chloride, Cl	212.0	7,500
Calcium, Ca	31.9	640
Magnesium, Mg	9.9	120
Sodium, Na	261.3	610
Total solids at 105° F.		19,200

An attempt was made to make a satisfactory mud by adding bentonitic clays, caustic soda, and quebracho to the native mud. The results were unsatisfactory. Water loss was never below 30 cc. and usually was about 50 cc. Viscosity and gels were difficult to control. Definite improvement in mud properties was essential to success in the contemplated program of coring and testing.

Pilot tests indicated that the addition of 3 lb. of Impermex per barrel of mud would reduce the water loss to about 6 cc. Further reduction seemed unnecessary inasmuch as other wells in the field had been drilled without trouble with muds having water losses between 10 and 15 cc. At this time the mud had a water loss of 46.5 cc. The salt content of the filtrate was 15,800 p.p.m.

High pH was selected as the means of preventing fermentation. A solution containing 50 lb. each of caustic soda and quebracho per barrel was added until the pH had been raised to 8.7 after which the addition of quebracho was discontinued and the pH was raised to 12.2 by adding a solution of 100 lb. of caustic soda per barrel. After adding 3,000 lb. of Impermex, the water loss was 6.7 cc.

Periodic additions of Impermex served to keep the water loss below 10 cc. until the well was completed. The pH was maintained at about 11.6 by regular additions of caustic soda and quebracho. The coring and testing program was carried out with complete freedom from trouble.

The average water loss of the mud during the 17-day period of treatment with bentonitic clays was 53 cc. as compared with 9 cc. for the Impermex mud in use 23 days. The use of average values conceals the fluctuations which characterized the first practice. A comparison of the costs of the two methods of mud treatment employed in this well is of little consequence because treatment with clays, caustic soda, and quebracho did not afford a satisfactory mud. It may be noted, however, that the average cost of mud materials was about $50 per day with the first method as against $65 per day while using Impermex. A factor in drilling costs far more important than the actual cost of mud materials, yet one which cannot be evaluated numerically, is the saving in time and equipment which results from avoidance of trouble caused by tight hole, sloughing of shale, and other difficulties which accompany the use of mud of poor wall-building qualities.

Drilling Salt Beds

In the Gulf Coast it usually has been necessary to case off any exposed shale sections if more than a few feet of rock salt had to be drilled. In some instances it has been feasible to drill the salt section with saturated salt-water mud; set casing through the salt; discard the salt-water mud, and prepare fresh-water mud for use in drilling ahead. In drilling with ordinary salt-water mud having poor wall-building properties, the danger of sticking the drill pipe is always present.

Recently, in a well with surface casing set at 2,015 ft., rock salt was encountered at 6,518 ft. and drilling was continued at 6,584 ft. before the condition was recognized. The drill pipe was pulled out of the hole and an electrical survey was made.

The mud in the pits weighed 9.4 lb. per gal., initial and 10-minute gel strengths were 100 g., and water loss was 21 cc. Water was added to the mud, followed by enough salt to make a saturated solution. Approximately 15 lb. of Impermex were added per barrel of mud. The mud in the hole was displaced in batches by salt-water Impermex mud.

When drilling was resumed, the mud weighed 10.5 lb. per gal., had a viscosity of 45 seconds funnel, A.P.I., very low gels, and the volume of filtrate was less than 1 cc. on 30-minute test.

Salt was drilled to 6,677 ft. After drilling 30 ft. of shale, a second bed of salt was encountered which continued to 7,935 ft. No more salt was drilled during the completion of the hole. The well was drilled to 10,765 ft.

As drilling progressed, saturated salt water and Impermex were added to keep the properties of the mud fairly constant. Water loss was kept at about 2 cc.; weight at 10.6 lb. per gal., viscosity at about 55 seconds funnel, 35 cp. Stormer; initial gel 2 g., and 10-minute gel 15 g.

The salt-water Impermex mud was in use about 3½ months. Control of mud properties was simple. There was complete freedom from trouble from sloughing shales. At least one string of casing was saved by the use of the Impermex mud.

Other Uses

The examples cited were selected as illustrative of the methods of treatment which have been employed successfully in the Gulf Coast in overcoming some troublesome situations involving control of mud properties. A far more lengthy discussion would be required to cover adequately the variety of problems which have been solved by the use of organic colloids in drilling mud.

Impermex has been used extensively in overcoming the deleterious effects of anhydrite on mud. Other examples which could be described include the use of Impermex mud in workover jobs; in drilling the productive section of low-pressure wells; in marine drilling operations, in which sea water was used in the mud; in drilling thick sections of bentonitic shales, with resulting economies in cost of chemical treatment as a consequence of reduced dispersion of shale, and in drilling wells for fresh and salt-water injection and for brine production.

Acknowledgment

The assistance of Baroid field-service engineers in the Gulf Coast division in compiling the records on mud properties is acknowledged with gratitude.

References

1. U. S. Patent 1,991,637. P. E. Harth, assignor to National Lead Co.
2. "Impermex Preservative" No. 5 and No. 6 are compositions specifically designed to prevent fermentation of organic colloids in drilling muds.

New Geological Map of Ohio Is Available

Out of print for some 10 years, a new geological map of Ohio has just been issued by the Geological Survey of Ohio. The map measures 41 by 33 in., and the legend contains 14 different types of formations. The map, which contains minor revisions from the previous edition, also shows railroads and traction lines.

Gulf Coast's Fields Have Produced Nearly 6 Billion Barrels

(Tables Compiled by the Statistical Department of The Oil and Gas Journal)

ONE of the most prolific oil-producing areas in the United States, the Gulf Coast area, which includes the Upper and Lower Gulf Coasts of Texas and South Louisiana, had a cumulative production of 5,725,924,945 bbl. of oil up to March 1, 1947, from 16,578 flowing wells and 14,263 wells on pump. Of this amount, South Louisiana produced 1,163,693,643 bbl. from 3,772 wells, consisting of 2,640 flowing wells and 1,132 pumping wells.

The Texas Railroad Commission District 1, with 3,155 oil-producing wells, of which 130 are flowing wells and 3,025 are pumping wells, accounted for 256,853,339 bbl. of the cumulative production to date. The largest fields in this district, Luling-Branyon, Darst Creek, Salt Flat, and Somerset, had a combined accumulated output of 213,773,437 bbl., producing mainly from the Edwards lime and Upper Cretaceous formations.

Greta, Heyser, Placedo, the Refugio district, Tom O'Connor and West Ranch fields produced a total of 279,172,020 bbl. of District 2's cumulative 401,908,531 bbl. with 3,331 working wells. Conroe, the largest field in the Gulf Coast area, paced the 2-billion-barrel-plus production for District 3 with a total of 230,337,420 bbl. of oil to date. In this district, 8,111 producing wells yielded a daily average production of 411,161 bbl. The producing formations for these districts range from Pliocene beds, Frio-Vicksburg tops, Cockfield-Yegua zone of the Eocene age, to the Miocene.

While District 4 showed the greatest number of oil-producing wells in the coastal area, it accounted for only one-eighth of the cumulative production; 8,700 wells produced a daily average of 222,501 bbl. from the Miocene and Eocene series to bring this district's accumulated production to 693,042,099 bbl. Agua Dulce, Plymouth, Seeligson, Stratton, Willamar and East White Point are among the largest fields in this district with regard to daily average production, and producing formations are the Frio, Oligocene and Yegua strata.

SUMMARY OF GULF COAST PRODUCTION

Area or district—	Oil-producing wells— Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)
Texas Gulf	13,938	13,131	27,069	1,173,795	4,562,231,302
District 1	130	3,025	3,155	20,219	256,853,339
District 2	2,563	768	3,331	140,904	401,908,531
District 3	4,924	3,187	8,111	441,161	2,046,733,690
District 4	3,681	5,019	8,700	222,501	693,042,099
South Louisiana	2,640	1,132	3,772	349,010	1,163,693,643
Total Gulf Coast	16,578	14,263	30,841	1,522,805	5,725,924,945

TEXAS RAILROAD COMMISSION DISTRICT NO. 1

Field and County—	Year of discovery	Oil-producing wells— Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Adams, Medina	1926	....	....	....	gas	.....	900	Navarro and Taylor sds.
Alta Vista, Bexar	*1912	....	....	....	....	.....	220	Navarro sd.
Bateman (N. Dale), Bastrop	1932	....	3	3	6	648,833	2,200	Dale L., Serp.
Batesville, Zavala	1937	....	....	....	....	12,000	.....	
Bee Creek, Caldwell	1940	....	8	8	20	309,609	2,050	Dale L.
Bob Rose, Caldwell	1932	....	....	....	....	242,539	1,975-2,100	Austin ch.
Buchanan, Caldwell	1929	....	20	20	45	536,024	2,000-2,100	Serp., Austin ch., Edw. L.
Burdette Wells, Caldwell	1937	....	....	....	....	40,396	2,185-2,252	Austin ch., Edw. L.
Byersville, Williamson	1933	....	....	....	....	.....	915	Serp.
Calliham, McMullen	1918	....	45	45	115	1,090,793	875-1,050	Pettus, G. Wells, L. Novia
Campana, S., McMullen	1941	11	13	24	370	417,531	2,609-3,013	Pettus
Carrizo, Dimmit	1941	....	....	....	....	5,882	2,294	Navarro sd.
Carrizo Park, Dimmit	1945	....	....	....	cond.	727	2,700-2,900	Navarro
Carroll Estate, Bastrop	*1932	....	....	....	....	100,847	.....	
Carver-Kallison (Nash Creek), Guadalupe	*1937	....	....	....	....	46,012	.....	
Cedar Creek, Bastrop	*1933	....	....	....	....	235,003	1,675	Serp.
Cedar Creek, N., Bastrop	*1934	....	....	....	....	70,018	.....	
Chapman-Abbott, Williamson	1930	....	67	67	115	4,779,703	1,800	Serp.
Charlotte, Atascosa	1944	18	5	23	580	318,785	4,977-6,942	Edwards
Chicon Lake, Medina	1929	....	68	68	25	131,480	250-350-900	Navarro sd., Taylor
Clark, Guadalupe	1935	....	1	1	15	405,961	2,300-2,500	Austin ch.
Cooksey, Bexar	*1930	....	....	....	....	61,000	.....	
Crowther, McMullen	*1915	....	....	....	gas	.....	500	Dibole
County Line, McMullen	1946	....	....	....	gas	.....	1,926-1,973	Jackson sd.
Del Monte, Zavala	1947	1	....	1	30	891	3,304	Taylor
Dale, Caldwell	1927	....	40	40	55	1,562,827	2,200-2,500	Dale L., Serp., Austin ch.
Dale, West, Caldwell	1937	....	6	6	15	148,423	2,200-2,300	Serp.
Darst Creek, Guadalupe	1929	1	311	312	7,025	66,115,035	2,400-2,700	Edwards L.
Day, Guadalupe	1940	....	....	....	....	575	2,374	Austin ch.
Deupree (Incl. Alta Vista and Philtop), Bexar	1936	....	2	2	5	63,389	1,000	Navarro
Dunlap, Caldwell	1931	....	9	9	25	193,346	2,150-2,450	Taylor marl, Austin ch.
Dunlay, Medina	*1938	....	....	....	....	985	.....	
Eckert, Bexar	1928	....	92	92	45	1,052,679	800	Navarro
Elgin, Bastrop	*1941	....	....	....	....	1,648	.....	
Ellison-Young, Caldwell	1937	....	8	8	15	169,912	2,300	Edwards L.
Espanda Mission, Bexar	*1926	....	....	....	....	77	.....	
Ezzell, McMullen-Live Oak	1937	....	120	120	575	3,658,414	1,200	Hockley; 1,495 Loma Novia
Fairfield (LaCoste), Bexar	1938	....	....	....	....	4,945	1,175	Austin ch.
Gas Ridge, Bexar	1912	....	77	77	45	90,733	300-1,300	Navarro
Green Branch, McMullen	1942	2	1	3	70	80,507	3,932	Recklaw sd.; 5,684 Wilcox.
Hilbig, Bastrop	1933	12	....	12	630	17,644	2,300-2,500	Serp.
Holcomb, Milam	1946	....	....	....	....	.....	1,215	Austin ch.

TEXAS RAILROAD COMMISSION DISTRICT 1—(Continued)

Field and County—	Year of discovery	Oil-producing wells: Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Holman Ranch, Edwards	1947	....	....	....	....	.....	548	Ellenburger L.
Imogene, Atascosa	1942	22	9	31	605	623,486	7,550-7,665	Edwards
Jacob, McMullen	1926	....	73	73	205	1,974,988	700	Mirando; 1,050 Pettus
Jones (Adkins), Bexar	1921	....	....	....	....	969	600	Navarro
Jourdanton, Atascosa	1946	9	1	10	390	54,566	7,268	Edwards L.
Kimbro (Manda), Travis	1935	....	2	2	2	19,617	700-925	Serp.
Leona, Zavala	1945	....	....	....	....	.....	4,214	Navarro
Larremore, Caldwell	*1928	....	....	....	....	343,124	1,200	Chalk, Edwards
LaVernia (Elm Creek), Guadalupe	1939	....	18	18	20	74,768	782-1,807	Navarro
Lentz, Bastrop	1941	....	3	3	30	51,577	2,222	Dale L., Serp.
Loma Alto, McMullen	1935	....	2	2	40	225,012	2,200-2,250	Jackson
Loma Alto-Wilcox, McMullen	1944	6	....	6	145	117,213	6,860	Carrizo
Lone Oak, Bexar	*1935	....	....	....	....	2,000	.....	
Luling-Branyon, Guadalupe-Caldwell	1922	7	647	654	3,940	88,213,644	1,900-2,100	Austin ch., Edw. L.
Lytton Springs, Caldwell	1925	....	131	131	200	8,372,860	1,250-1,640	Serp.
Manford, Guadalupe	1929	....	1	1	20	512,894	2,290-2,615	Austin ch.
Matthews, Williamson	1933	....	10	10	10	156,506	1,000	Serp.
Minerva-Rockdale, Milam	1921	....	417	417	150	3,957,935	650-1,650	Navarro-Taylor
Muil, Atascosa	1946	....	....	....	....	4,745	8,836-8,936	Upper Edwards L.
Munson, McMullen	1938	....	11	11	25	231,140	1,225	Mirando
McKnight Ranch, Dimmit	1945	....	....	....	....	.....	2,640	Navarro
Manda, Travis	1935	....	....	....	....	.....	670	Serp.
Noack, Williamson	1933	....	30	30	35	491,612	900	Serp.
Pearsall (Austin ch.), Frio	1934	2	20	22	225	3,256,955	5,200	Austin ch.
Pearsall (Navarro sd.), Frio	1934	7	24	31	1,030		3,900	Navarro; 5,400 Austin ch.
Rhode, McMullen	1936	....	....	....	gas	.....	1,800	Cole
Riddle, Bastrop	1938	....	2	2	25	124,104	1,770	Serp.
Rosilla Creek, Bexar	1946	....	....	....	gas	.....	845	Navarro
San Caja, McMullen	1944	....	....	....	gas	.....	6,439-6,930	Carrizo
Salt Flat, Caldwell	1928	10	195	205	1,500	46,519,810	2,400-2,730	Austin ch., Edw.
Salt Flat, North, Caldwell	*1939	....	....	....	....	33,748	2,500	Austin ch.; 2,700 Edw. L.
Schattel, Frio	*1938	....	....	....	....	633	.....	
Schimmel-Batts, Bastrop	*1935	....	....	....	....	7,000	.....	
Somerset, Bexar-Atascosa	1911	....	274	274	155	11,924,948	900-2,100	Navarro, Taylor marl
Southton (Yturri-Southton), Bexar	1922	....	103	103	25	717,129	900	Navarro
Spiller, Guadalupe	1938	....	3	3	10	19,966	2,290	Buda L.
Staples, Guadalupe	1935	....	....	....	....	1,000	.....	

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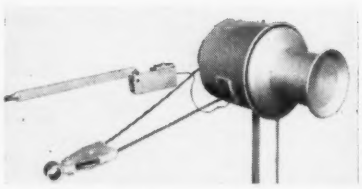

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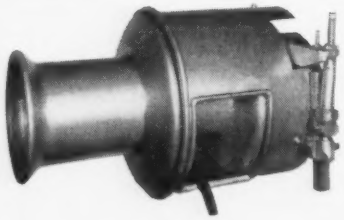

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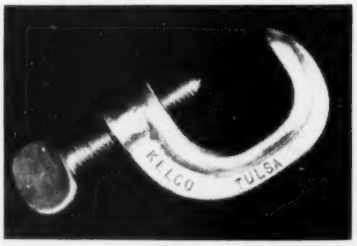

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TEXAS RAILROAD COMMISSION DISTRICT 1—(Continued)

Field and County—	Year of discovery	Oil-producing wells: Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
San Jose, McMullen	*1938	....	....	....	gas	.....	1,147	Cole
Taylor-Ina, Medina	1922	....	1	1	2	167,211	925	Navarro
Tenney Creek, Caldwell	1940	....	14	14	55	497,469	2,240-2,593	Taylor, Austin ch.
Thrall, Williamson	1915	....	21	21	65	2,576,802	900	Serp.
United, Guadalupe	1944	....	1	1	5	16,113	2,595	Austin ch.
Von Ormy, Bexar	1931	....	91	91	35	323,509	600-700	Navarro
Wentz, McMullen	1932	....	....	....	gas	.....	370	Cole
Walnut Creek and Walnut Creek, New, Caldwell	1938	....	1	1	4	5,099	1,290	Serp.
Washburn Ranch, LaSalle	1940	10	10	20	605	1,253,244	5,091-5,567	Wilcox
Weigang (Fashing), Atascosa	1946	12	....	12	785	90,521	3,750	Wilcox
Willow Flat, Milam	1946	....	....	....	gas	.....	2,100	Nacatoch sd.
Yoast, Bastrop	1928	....	5	5	30	984,740	1,500	Serp.
Zoboroski, Guadalupe	1931	....	9	9	20	289,869	2,200	Austin ch.
Total		130	3,025	3,155	20,219	256,853,339		

*Abandoned.

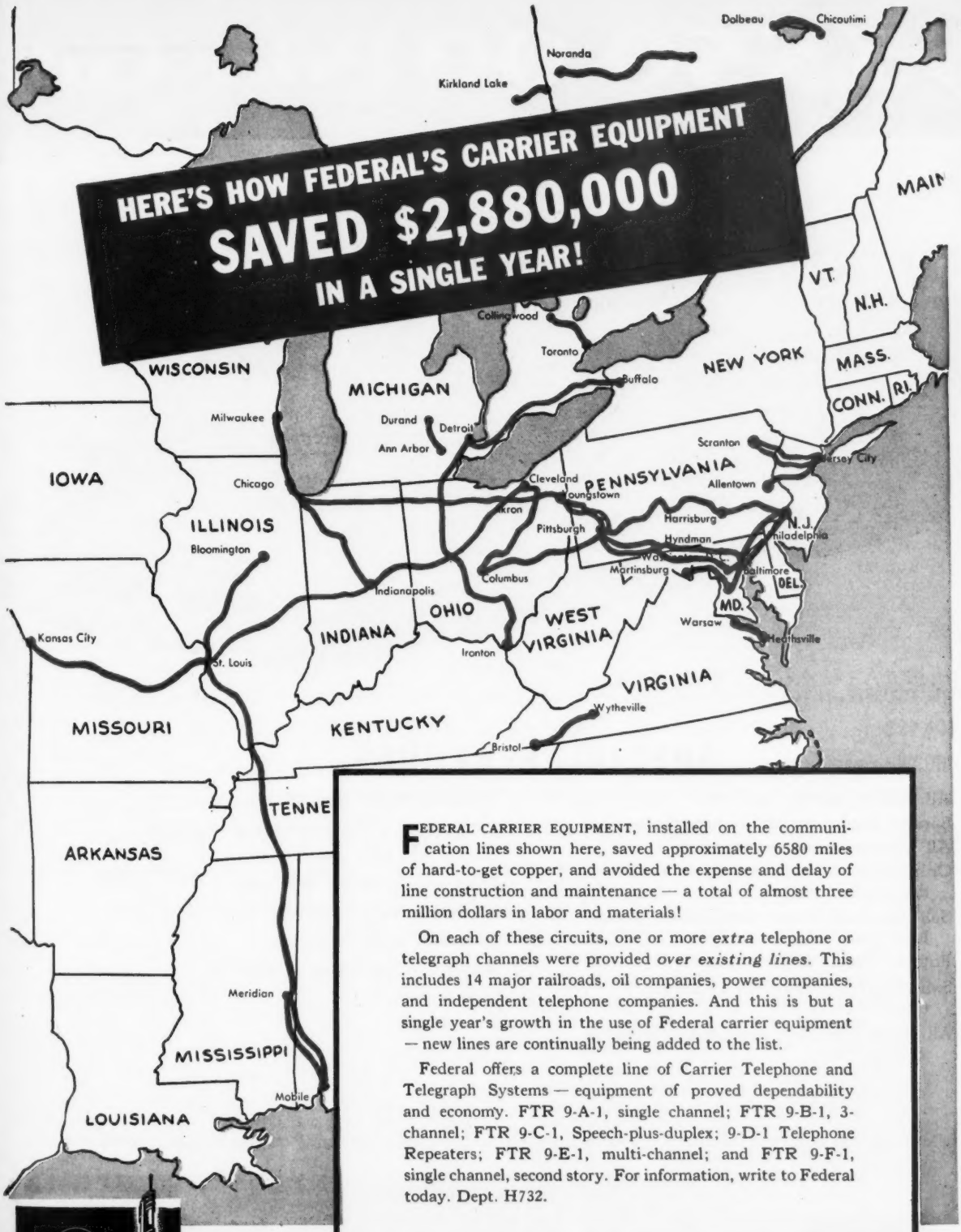
TEXAS RAILROAD COMMISSION DISTRICT NO. 2

Albert West, Live Oak	1945	1	....	1	5	10,800	6,730	Wilcox
Albrecht, Goliad	1944	....	....	....	....	.....	8,350	Wilcox
Anaqua, Victoria	1944	....	....	....	gas	.....	5,350	Frio
Berclair, Goliad	1945	....	....	....	gas	.....	9,884	Wilcox
Brushy Creek, DeWitt and Lavaca	1941	....	....	....	gas	.....	7,680	Wilcox
Beeville (Church), Bee	1935	....	....	....	....	435	.....	
Blanconia, Bee	1943	6	....	6	115	133,647	4,060	Frio; 4,950 Vicksburg
Bonnie View, Refugio	1938	58	....	58	2,695	75,531	4,500	Greta
Boyce, Goliad	1945	11	....	11	520	193,249	7,460	Wilcox
Burnell, Karnes	1935	14	....	14	360	216,878	3,430	Pettus
Burnell, South, Karnes-Bee	1937	2	33	35	390	1,282,181	3,650	Pettus
Belknap, Karnes	1945	....	....	....	....	.....	7,030	Wilcox
Burnell-Wilcox, Karnes	1943	....	....	....	....	60,104	6,750	Wilcox
Cabeza Creek, Goliad	1943	7	....	7	500	206,978	7,750	Wilcox
Cabeza Creek, So., Goliad	1944	4	....	4	260	102,320	8,306	Carrizo
Caesar (Ruhman), Bee	1934	....	9	9	25	1,087,497	3,055	Pettus
Caesar, South, Bee	1942	35	3	38	1,345	2,449,567	6,600	Wilcox
Chapa, Live Oak	1944	....	....	....	....	.....	8,170	Carrizo-Wilcox
Coleto Creek, Victoria	1933	24	13	37	765	2,329,054	2,776-2,880	Catalhoula
Collier, Jackson	1942	3	....	3	....	154,487	2,400	Vicksburg
Cologne, Victoria	1939	....	7	7	80	406,158	2,870-4,830	Catahoula
Coloma Creek, Calhoun	1941	....	....	....	....	53,366	5,585	Catahoula
Cordele, Jackson	1938	24	19	43	....	3,761,666	2,566-2,755	
Cosden, West, Bee	1943	3	1	4	160	28,689	3,639-7,390	Wilcox
Coquat, Live Oak	1943	....	....	....	cond.	.....	7,460-7,560	Wilcox
Cottonwood Creek, DeWitt	1944	....	....	....	cond.	.....	7,627	Wilcox
Coy City, Karnes	1945	....	....	....	cond.	.....	7,145	Wilcox
Diamond Half, Goliad	1936	....	5	5	40	693,123	2,660-3,905	
Dinero, Live Oak	*1935	....	....	....	....	83,913	.....	
Dirks, Bee	1934	....	66	66	480	7,329,382	3,850-3,925	Pettus
Dial, Goliad	1944	....	....	....	....	.....	8,935	Carrizo
El Toro, Jackson	1944	....	....	....	gas	.....	5,820	Frio
Edna, Jackson	1921	....	....	....	gas	.....	3,945	Cockfield; 4,770 Frio
Fagan, Refugio	1940	2	....	2	5	102,924	2,100	Oakville; 5,900 Frio
Falls City, Karnes	1944	60	....	60	4,135	1,663,107	4,650-6,050	Pettus
Fannin, N., Goliad	1944	1	....	1	5	2,580	5,925	Cook Mtn.
Fort Merrill, Live Oak	*1935	....	....	....	....	32,000	.....	
Francitas, Jackson	1938	19	....	19	....	1,248,995	7,384-8,277	Frio
Gaffney, Victoria	1945	2	1	3	45	41,431	5,030	Frio
Ganado, Jackson	1937	41	8	49	1,515	2,735,553	5,010-6,485	Frio
Ganado, West, Jackson	1940	49	5	54	2,180	2,781,562	4,730-6,174	Frio
Genevieve, Bee	1941	....	....	....	....	1,206	.....	
Goebel, Live Oak	1943	1	....	1	5	33,759	6,900-7,052	Wilcox
Goliad, West, Goliad	1945	1	....	1	10	38,139	5,010	Cockfield; 7,589 Queen City; 8,579 Wilcox
Grayburg (Kimble), Bee	1934	....	....	....	....	5,000	.....	
Green, Karnes	1944	2	2	4	165	70,746	6,535	Wilcox
Greta, Refugio	1933	162	36	198	10,015	41,136,821	3,500-4,400	Catahoula; 6,250 Frio
Harmon, Jackson	1942	6	11	17	520	783,604	5,317-5,400	Frio
Heyser, Calhoun	1936	120	62	182	5,320	29,196,764	5,400-6,000	Frio
Hinnant, Live Oak	1945	1	....	1	40	26,513	5,772	Yegua
Hobson, Karnes	1943	11	....	11	580	816,529	4,205	Recklaw
Holzmark, Bee	1935	4	2	6	80	227,572	3,414-4,100	Hockley
Hondo Creek, Karnes	1943	2	2	4	115	180,768	6,582-6,646	Wilcox
Hordes Creek, Goliad	1929	1	....	1	5	92,120	4,500-45	Cockfield
Hysaw, Karnes	1945	8	....	8	145	65,610	3,900-82	Wilcox
Jay Welder (Duck Bay), Calhoun	1940	5	....	5	275	452,594	5,635	Catahoula
Kay Creek, Victoria	....	....	....	....	....	.....	5,091-5,132	Frio
Keeran, Victoria	1932	7	9	16	805	2,733,447	5,600-7,000	Frio
Kittie, Live Oak	1943	1	....	1	15	7,748	1,440	Jackson
Koontz, Victoria	1944	4	....	4	50	66,510	4,750	
Keeran, North, Victoria	1940	....	....	....	....	.....	5,300	Frio
Kittie, West, Live Oak	1945	....	....	....	....	.....	6,715	Wilcox
La Rosa, Refugio	1938	68	4	72	3,475	8,791,847	5,400-6,500	Frio
La Rosa, North, Refugio	1943	1	....	1	35	107,117	6,170	Frio
LaSalle, Jackson	1943	5	1	6	315	181,668	5,062-6,086	Marg.-Frio
La Ward, North, Jackson	1941	84	14	98	2,470	4,260,259	5,200	Marg.; 5,585-6,281 Frio
Little Kentucky, Jackson	1943	4	....	4	160	159,129	5,700	Frio
Lolita, Jackson	1940	174	29	203	5,820	12,865,044	5,398-6,400	Marg.-Frio
McCaskill, Karnes	1944	....	....	....	gas	.....	7,415	Wilcox

TEXAS RAILROAD COMMISSION DISTRICT 2—(Continued)

Field and County—	Year of discovery	Oil-producing wells— Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
McFaddin, Victoria	1930	54	31	85	4,985	11,161,636	5,100-6,200	Frio-Vicksburg
McFaddin, N., Victoria	1937	5	....	5	195	315,699	2,800-6,350	Frio
McMurray, Bee	1937	....	....	....	....	6,934	.....	
McNeil, Live Oak	1934	2	....	2	25	307,917	4,350	Jackson; 4,375 Hockley; 5,172 Cockfield; 5,209 Pettus; 5,418 Yegua
Maurbro, Jackson	1941	68	17	85	....	3,280,808	5,210-5,485	Marg.
Mauritz, Jackson	1935	5	4	9	....	1,195,175	5,625	Frio
Mauritz, East, Jackson	1944	3	....	3	....	52,414	5,540-5,820	Frio
Mauritz, West, Jackson	1942	14	....	14	....	1,151,773	5,440-5,590	Frio
Mayo, Jackson	1942	30	9	39	....	2,367,188	5,067-5,138	Marg.; 5,247-5,630 Frio
Melon Creek, Refugio	1939	10	....	10	185	1,193,547	5,850-5,900	Frio
Mineral, Bee	1943	....	....	....	....	500	7,470-7,500	Wilcox
Mission River, Refugio	1938	3	12	15	360	1,932,142	5,183-6,843	Frio
Mission Valley, Victoria	1944	....	....	....	....	.....	8,400	Wilcox
Moody Ranch, Jackson	1945	....	1	1	50	18,537	8,830	Frio
Mount Lucas, Live Oak	1923	1	3	4	50	263,486	2,510-5,200	Frio
Mustang Creek, Jackson	1942	....	....	....	....	.....	.....	
Medio Creek, Bee	1942	....	....	....	gas	.....	4,855	Vicksburg
Morales, Jackson	1946	....	....	....	gas	.....	4,150	
Nordheim, DeWitt	1942	....	....	....	....	.....	7,000-40	Wilcox
Normanna, Bee	1929	1	2	3	15	119,813	3,625-3,742	Hockley
Normanna, North, Bee	....	....	....	....	....	776	.....	
Oakville, Live Oak	1937	....	20	20	260	1,389,028	1,830-2,836	Jackson, Hockley, Cockfield
Oakville-Wilcox, Live Oak	1944	1	....	1	2	1,362	6,738-6,950	Wilcox
O'Connor-McFaddin, Victoria	1931	1	1	2	25	636,330	2,245	Catahoula; 4,134 Frio
Ormsby, Wilson	1945	....	....	....	....	270	5,030	Buda
Ottine, Gonzales	*1902	....	....	....	....	12,000	.....	
Pettus, Bee	1929	....	27	27	595	9,804,923	3,890	Pettus
Pettus, New, Bee, Goliad, Karnes	1933	....	34	34	525	4,110,586	3,670	Pettus
Pettus, North, (Wilcox), Bee	1942	5	....	5	195	38,804	6,810-6,975	Wilcox
Placedo, Victoria	1935	34	102	136	4,440	20,578,238	4,700-6,000	Frio
Placedo, East, Victoria	1937	28	5	33	1,150	2,443,749	6,000-6,892	Frio
Plummer, Bee	1935	1	....	1	30	300,867	3,050-55	Pettus
Poehler, Goliad	1946	7	....	7	155	76,789	8,320	Wilcox
Porter, Karnes	1943	9	1	10	430	792,905	4,000-4,109	Pettus
Port Lavaca, Calhoun	*1934	....	....	....	....	420,941	.....	
Poth, Wilson	*1943	....	....	....	....	100	.....	
Prideham's Lake, Victoria	1944	10	1	11	360	194,832	4,770	Vicksburg
Prideham's Lake, West Victoria	1946	14	....	14	555	71,963	4,735	Vicksburg
Powderhorn (Gas), Calhoun	1939	....	....	....	....	.....	4,628-5,850	Frio
Provident City, Lavaca	1941	....	....	....	gas	.....	8,314-8,540	Wilcox
Ray, Bee	1935	....	7	7	85	1,761,050	3,940	Pettus
Refugio-Fox, Refugio	1931	14	4	18	580	4,961,839	3,500	Catahoula; 6,480 Frio
Refugio-Heard, Refugio	1945	45	....	45	2,060	629,995	6,217	
Refugio, New, Refugio	....	51	38	89	3,815	15,126,208	3,900-6,200	Catahoula
Refugio, North, Refugio	1941	4	....	4	70	188,456	5,664	Frio
Refugio, Old, Refugio	1920	3	26	29	725	39,741,207	1,900-6,585	Oakville, Catahoula, Het Frio
Runge, Karnes	1943	9	1	10	470	557,500	6,575	Frio
Rutledge, Bee	*1935	....	....	....	....	21,000	.....	
Ray-Wilcox, Bee	1944	....	....	....	....	.....	7,574-7,600	Wilcox
Steamboat Pass, Calhoun	1941	....	....	....	....	.....	2,880-2,900	Catahoula
Schwartz, Live Oak	1946	2	....	2	95	6,636	4,011-19	
Sarco, Goliad	*1938	....	....	....	....	2,401	.....	
Sheriff, Calhoun	1945	24	....	24	845	246,087	5,710-55	Frio
Slick, Goliad-DeWitt	*1930	....	....	....	....	75,617	.....	
Slick-Wilcox, Goliad	1943	47	1	48	4,280	4,174,160	7,503-7,600	Wilcox
Sliva, Bee	1946	....	1	1	2	436	3,425	Frio; 4,395 Stillwell
Stewart, Jackson	1942	7	2	9	....	475,412	5,000	Marg.
Stockdale, Wilson	*1945	....	....	....	....	685	.....	
Telferner, Victoria	1938	1	1	2	10	38,281	2,500-2,700	Catahoula
Telferner, East, Victoria	1945	3	....	3	60	73,651	4,430-4,850	Frio
Terrell, Victoria	*1940	....	....	....	....	13,663	.....	
Terrel Point, Goliad	1943	4	....	4	30	38,421	4,650	Frio
Texana, Jackson	1941	....	....	....	....	.....	5,102	Marg.; 5,555-5,730 Frio
Theis (Clemens), Bee	1945	1	4	5	210	107,986	3,565	Hockley
Thomaston, DeWitt	1940	....	....	....	....	6,503	7,855-90	Wilcox
Tom O'Connor, Refugio	1934	526	....	526	44,760	100,856,015	5,600-5,900	Frio
Tuleta and West, Bee	1932	....	12	12	95	2,093,976	3,100-4,480	Jackson, Pettus
Tulsita, Bee	1938	....	1	1	5	16,805	3,575-3,632	Pettus
Tulsita, South, Wilcox, Bee	1945	20	....	20	900	378,746	7,036	Wilcox
Tynan, Bee	1942	2	....	2	20	23,734	4,195-4,686	Vicksburg
Toro Creek, Bee	1944	....	....	....	....	.....	3,885	Pettus
Vanderbilt, Jackson	*1934	....	....	....	....	.....	.....	
Victoria, Victoria	1940	1	6	7	90	497,484	2,550-3,100	Catahoula, Marg.
Vienna, Lavaca	1945	2	....	2	50	20,653	8,347-8,650	Wilcox
Voss, Bee	*1936	....	....	....	....	78,446	.....	
Weesatcne, South, Goliad	1946	....	....	....	gas	.....	5,060	Yegua
Warmley, DeWitt	1944	....	....	....	....	194	7,085	Wilcox
Weesatche, Goliad	1944	....	1	1	5	7,985	7,980	Wilcox
Weser, Goliad	*1936	....	....	....	....	35,433	4,800	Yegua
West Ranch, Jackson	1938	428	18	446	20,175	41,348,311	5,086-5,780	Frio
White Creek, Live Oak	1939	....	27	27	85	520,442	1,300-1,500	Hockley
White Creek, S., Live Oak	1941	....	6	6	60	244,926	1,820	Jackson
Whittington, Live Oak	1935	....	....	....	....	3,000	.....	
Woodsboro, Refugio	1941	10	....	10	350	546,166	3,100-5,900	Frio
Word, Lavaca	1945	....	....	....	....	1,546	5,875	Wilcox

(Continued on Page 251)



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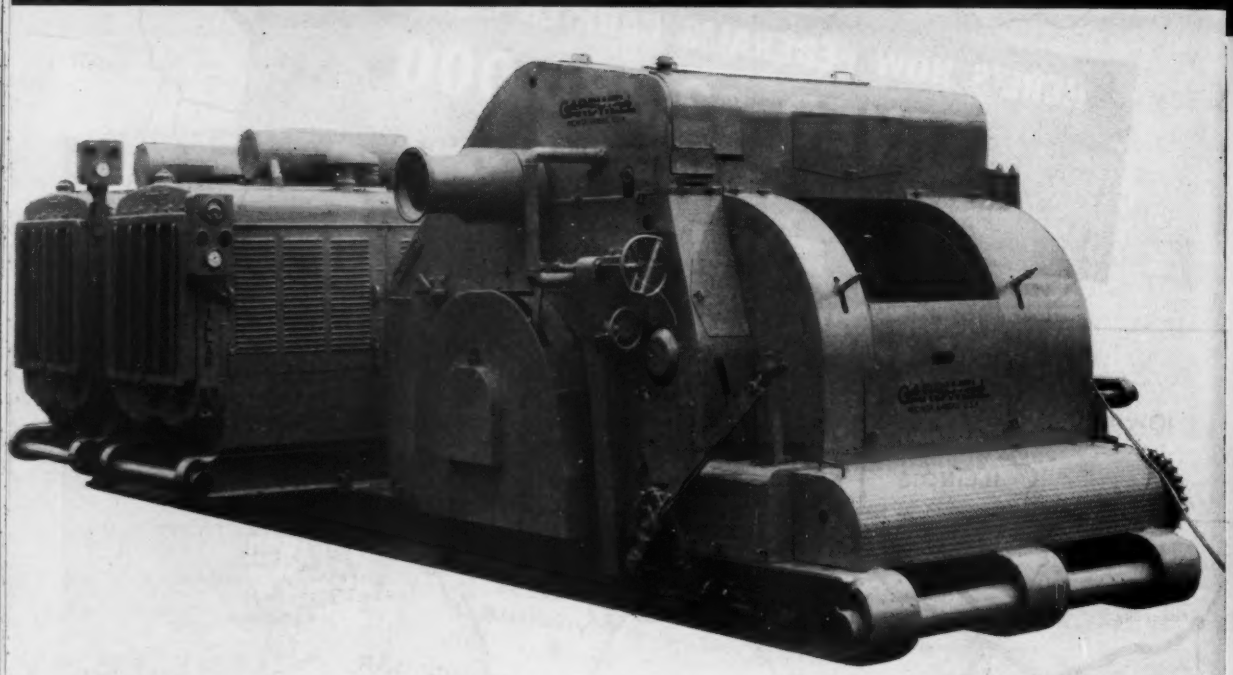

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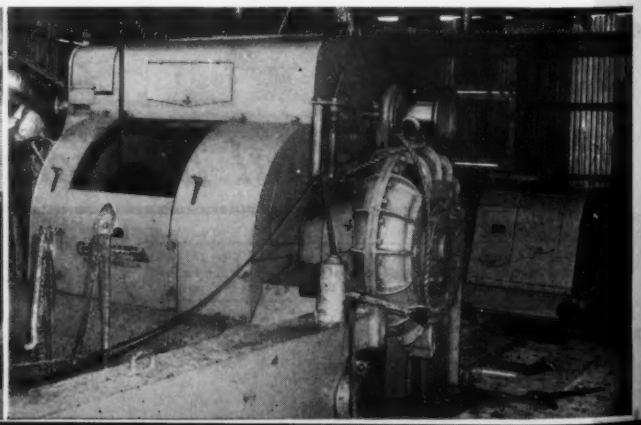

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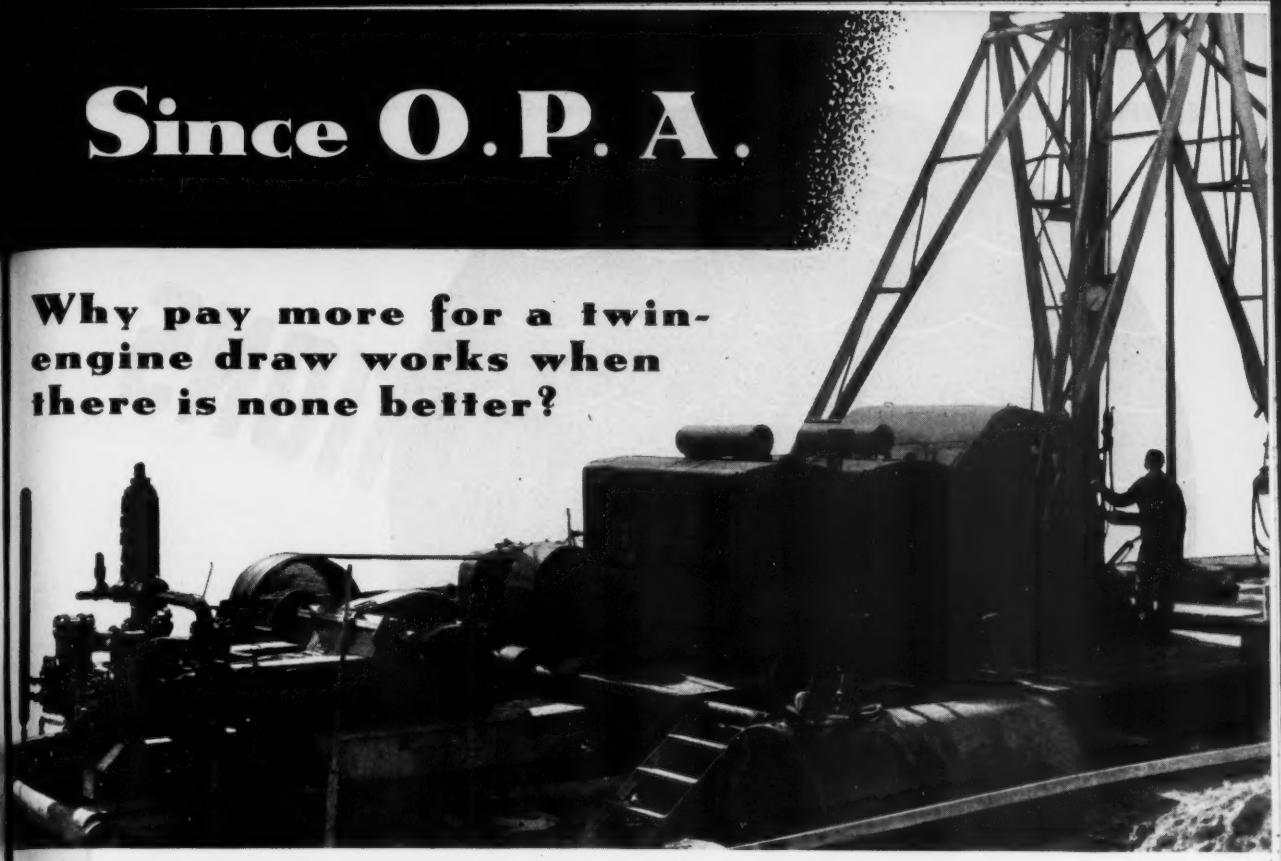

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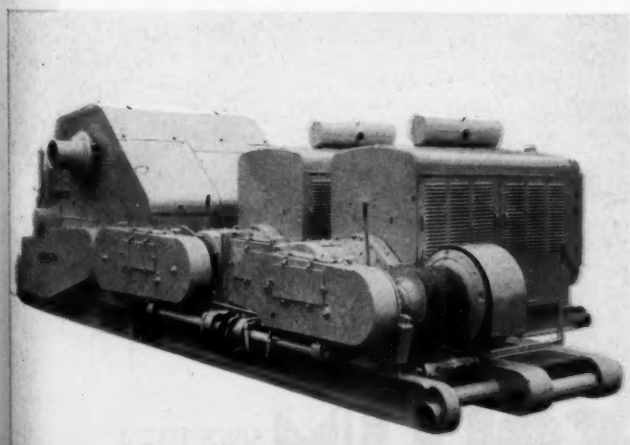

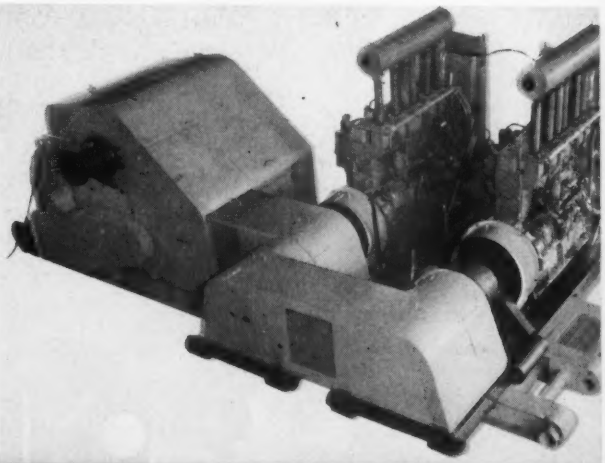

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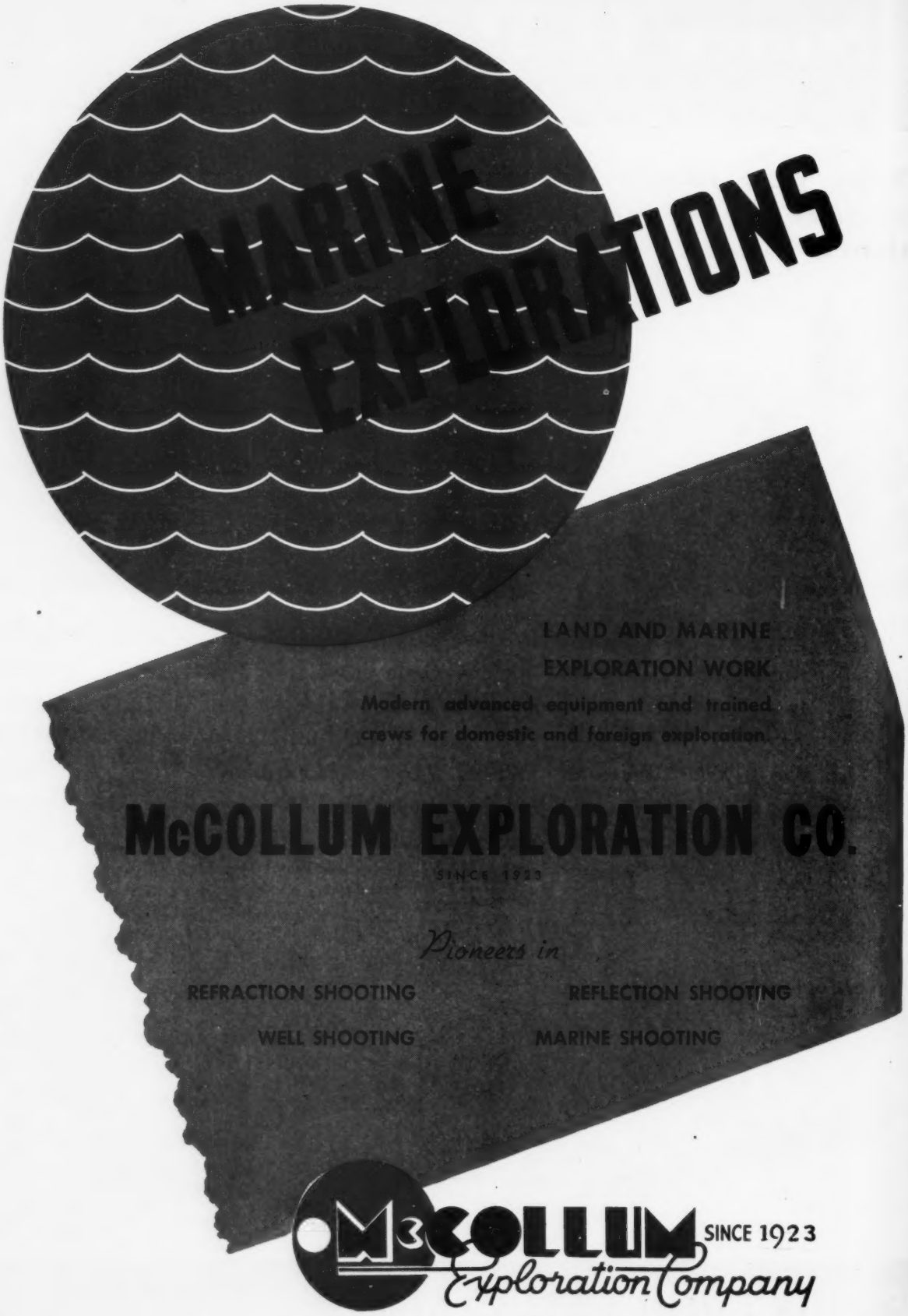
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TEXAS RAILROAD COMMISSION DISTRICT 2—(Continued)

Field and County—	Year of discovery	Oil-producing wells: Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Welder Ranch, Victoria	1946	....	....	....	gas	.....	5,700	Frio
Yougeen, Bee	1944	15	....	15	340	177,842	3,800	Vicksburg
Yorktown, DeWitt	1942	....	....	....	....	.....	7,125	Wilcox
Total		2,563	768	3,331	140,904	401,908,531		

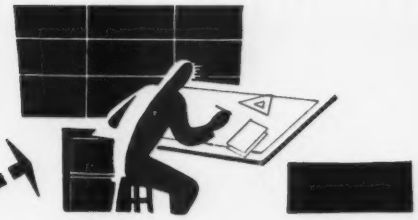
*Abandoned.

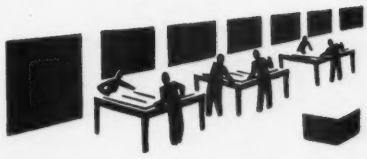
TEXAS RAILROAD COMMISSION DISTRICT NO. 3

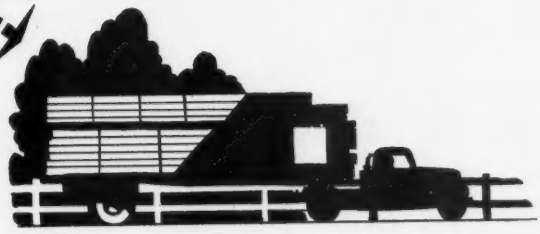
Abel Borden (Mackey), Wharton	*1940	....	....	....	....	46,945	4,760	Frio
Aldine, Harris	1939	1	....	1	....	185,471	6,640-7,530	Yegua 7,920 ft.
Aldine, West, Harris	*1942	....	....	....	cond.	.....	7,190	Yegua
Alief, Harris	1942	....	....	....	cond.	6,327	7,920-8,080	Yegua
Allen, Brazoria	*1927	....	....	....	....	90,008	4,346-5,584	Miocene
Alta Loma, Galveston	1940	6	....	6	....	1,083,887	9,185	Frio
Altair, Colorado	*1945	....	....	....	cond.	.....	8,260	Wilcox
Amelia, Jefferson	1936	94	....	94	4,120	13,660,607	6,320	Marg.; 6,770 Frio
Anahuac, Chambers	1935	324	27	351	27,100	67,281,359	6,825	Marg.; 7,235 Frio
Angleton (Anchor), Brazoria	1939	1	....	1	5	57,416	10,475	Frio
Armour (McCrosky), Matagorda	1938	....	2	2	5	189,573	1,620	Frio; Miocene 7,190
Arnim, Fayette	1945	....	6	6	115	57,122	2,050	Wilcox
Arriola, Hardin	1932	....	12	12	185	2,731,943	3,000	Marg.; 4,700 Frio
Addicks, Harris	*1945	....	....	....	....	.....	7,705	Yegua*
Ashwood, Matagorda	1944	....	....	....	....	.....	8,740	Frio
Bailey's Prairie, Brazoria	1940	....	....	....	cond.	1,766	10,540	Frio (shut in soon after discovery)
Bammel, Harris	1937	2	....	2	215	371,849	6,190	Yegua
Barbers Hill, Chambers	1916	22	97	119	5,230	85,448,452	400-1,012	Caprock and Miocene; 3,490-4,450 Marg.; 5,530 Frio
Batson, Hardin	1903	3	121	124	480	41,352,074	1,000	Miocene; 3,490 Marg.; 3,975 Frio; 5,600 Yegua
Bay City (Van Vleck), Matagorda	1934	52	....	52	4,175	11,334,624	7,000-8,500	Frio
Bay City, East, Matagorda	1945	....	....	....	....	2,012	10,093-10,323	Frio
Bay City, North, Matagorda	1942	18	1	19	1,095	1,677,447	7,750-8,411	Frio
Beaumont, West, Jefferson	1936	22	28	50	1,380	7,180,074	2,890-4,650	Catahoula; 5,360 Discorbis; 5,600 Het.; 5,880 Marg.; 6,100 Frio
Beech Creek, Hardin	1944	2	....	2	130	134,133	6,235	Yegua
Beech Creek, North, Hardin	1944	1	....	1	105	124,367	6,230	Yegua
Big Creek, Fort Bend	1922	2	14	16	385	10,862,604	800	Miocene; 4,500 Marg.-Frio
Big Hill, Jefferson	*1923	....	....	....	....	14,000	1,700-1,800	Miocene
Big Hill (Gulf), Matagorda	*1904	....	....	....	....	211,000	825	Caprock
Bland, Orange	*1941	....	....	....	....	.....	.....	
Blessing, Matagorda	*1940	....	....	....	....	.....	8,280-8,460	Frio
Blessing, East, Matagorda	1946	1	....	1	5	4,120	8,840	Frio
Blue Lake, Brazoria	1945	12	2	14	1,165	702,558	8,516-11,010	Frio
Blue Ridge, Fort Bend	1919	6	32	38	675	12,831,825	1,800	Miocene; 4,200 Marg.-Frio
Boling, Wharton-Fort Bend	1925	11	22	33	880	9,345,578	3,720-4,860	Marg.-Frio
Brenham, Washington	1915	....	....	....	....	391,932	190-1,410	Pliocene, Oakville, Yegua
Brookshire, Waller-Austin	*1934	....	....	....	....	22,420	2,970	Oligocene
Buckeye, Matagorda	1932	....	1	1	5	845,185	7,750-7,925	Lower Marg.-Frio; 8,100-8,780 Frio
Buckeye, So., Matagorda	1942	1	....	1	10	62,224	.....	
Buck Snag, Colorado	1942	....	....	....	gas	23,547	6,130	Yegua
Buttermilk Slough, Matagorda	*1939	....	....	....	cond.	10,774	7,850	Frio
Bryan Mound, Brazoria	*1935	....	....	....	sulfur	.....	3,425	Miocene
Call, Newton	*1937	....	....	....	....	11,415	6,910	Yegua
Camp Eleven, Tyler	1942	1	1	2	130	391,166	8,000	Wilcox
Caplen, Galveston	1939	16	2	18	1,210	2,142,017	6,160-7,650	Mio.-Olig.
Cedar Bayou, Chambers	1937	....	1	1	10	43,078	6,425	Marg.; 7,180 Frio
Cedar Point, Chambers	1938	25	5	30	2,170	3,832,407	3,660-4,435	Miocene; 5,970 Frio
Cheek, North, Jefferson	*1937	....	....	....	....	33,000	8,330	Frio
Chenango, Brazoria	1941	1	....	1	25	112,099	8,565-10,020	Frio
Chesterville, Colorado	*1943	....	....	....	....	3,993	6,855	Yegua; 9,500 Wilcox
China, South, Jefferson	1939	7	2	9	580	1,461,647	7,490-7,840	Frio
Chocolate Bayou, Brazoria	1939	12	....	12	1,560	926,077	9,660-11,470	Frio
Chriesman (Tanglewood), Burleson	*1938	....	....	....	....	14,453	.....	
Cistern, Fayette	1942	....	4	4	35	46,257	1,190	Reklaw; 3,865 Wilcox
Clam Lake (McFadden), Jefferson	1937	13	2	15	890	1,535,835	2,500	Pliocene; 3,900 ——; 4,400 Oakville; 5,900-6,400 Catahoula
Clay Creek, Washington	1928	....	44	44	505	5,652,118	1,124-1,500	Miocene, Yegua and Wilcox
Clear Lake, Harris	1938	33	3	36	3,700	7,846,964	5,735-5,875	Frio
Cleveland, Liberty	1933	3	4	7	265	1,773,444	5,670-5,885	Yegua; 9,050-9,150 Wilcox
Cleveland, No. (Grogan), Liberty	1945	3	....	3	235	52,664	5,780	Yegua
Clinton, Harris	1936	6	1	7	125	502,083	3,200-3,600	Miocene; 8,100 Yegua
Clodine, Fort Bend	1941	22	....	22	565	1,300,786	7,485	Yegua
Cold Springs, San Jacinto	1945	12	1	13	515	188,560	4,375-4,502	Yegua; 7,900 Wilcox
Columbus, Colorado	1944	2	....	2	55	42,060	7,300-7,800	Wilcox
Conroe, Montgomery	1931	704	175	879	55,355	230,337,420	5,000-5,250	Yegua
Conroe, West, Montgomery	1941	1	....	1	25	48,978	4,730	Yegua
Cotton Lake, Chambers	1936	1	3	4	130	1,152,386	6,280	Marg.; 6,355 Frio
Cotton Lake, So., Chambers	1936	6	19	25	480	4,015,099	6,460	Marg.; 6,510 Frio
Cottonwood, Liberty	1943	3	....	3	70	121,464	7,705	Frio
Citrus Grove, Matagorda	1939	....	....	....	gas	.....	3,970-4,100	Miocene

TEXAS RAILROAD COMMISSION DISTRICT 3—(Continued)

Field and County—	Year of discovery	Oil-producing wells: Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Crescent (Hamburger), Wharton	1945	....	....	....	gas	.....	4,450	Frio
Clemens, Brazoria	1945	....	....	....	....	.....	.....	
Daboval, Wharton	1944	2	2	4	40	80,609	7,025-7,235	Frio
Damon Mound, Brazoria	1915	....	23	23	105	10,051,017	1,385-2,740	Frio
Danbury, Brazoria	1930	13	17	30	1,560	2,448,336	1,350-1,970	Miocene; 5,655-7,625 Frio
Dickinson, Galveston	1934	27	14	41	1,120	9,448,063	7,800-9,225	Frio
Double Gum Bayou (South Anahuac), Chambers	1938	....	....	....	....	1,013	7,550-9,000	Frio
Dyersville, Harris	1940	29	39	68	2,390	3,815,861	3,475-90	Miocene; 4,060-6,080 Frio
East Bernard (O'Conner), Wharton	1940	....	....	....	cond.	.....	7,495-7,650	Yegua; 8,090 Cook Mt.
El Campo, Wharton	1944	8	10	18	490	260,235	6,140-7,575	Frio
Elm Bayou, Chambers	1945	1	....	1	90	116,472	8,400	Frio
Esperson, Liberty	1929	24	39	63	1,815	10,084,652	4,060-90	Frio; 6,690-8,090 Yegua
Esperson, So., Liberty	1939	25	....	25	840	2,272,333	.....	
Eureka Heights, Harris	1934	2	12	14	650	4,979,158	8,075	Yegua
Egypt, Wharton	1945	....	....	....	gas	.....	2,825	Oakville
Fairbanks-Rosslyn, Harris	1938	237	29	266	5,610	21,808,404	3,200	Catahoula; 7,280 Yegua
Fannett, Jefferson	1927	56	16	72	7,066	12,917,575	3,200	Catahoula; 7,345 Marg.; 8,000 Frio
Fig Ridge, Chambers	1940	68	....	68	6,282	9,456,948	8,500	Frio
Fisher's Reef, Chambers	1940	2	....	2	110	232,410	8,980	Frio
Fostoria, Montgomery	*1942	....	....	....	....	7,298	5,790	Yegua
Fred, Tyler	1941	....	3	3	80	192,332	8,180-8,630	Wilcox
Frelsburg, Colorado	1944	....	....	....	cond.	.....	8,160-9,280	Wilcox
Friendswood, Harris	1937	(see Webster)			....	.....	.....	
Glendale, Trinity	1946	....	....	....	cond.	.....	10,500	Edwards lime
Gilbert Ranch, Jefferson	1945	....	....	....	cond.	.....	8,680	Frio
Garwood, Colorado	*1932	....	....	....	....	6,198	4,000-6,150	Frio and Yegua
Garwood, West, Colorado	1941	4	1	5	10	168,335	6,100	Yegua; 9,430 Wilcox
Gillock, Galveston	1935	68	27	95	3,395	13,069,878	7,600-9,100	Frio
Glasscock, Galveston	1944	1	....	1	20	22,689	9,190-9,300	Wilcox
Goodrich, Polk	*1941	....	....	....	....	72,900	4,030	Yegua
Goose Creek, Harris	1906	10	74	84	1,350	80,618,952	1,000-4,600	Pliocene - Miocene; many sands avg. 40 ft. thick.; 4,600-35 Frio
Greens Lake, Galveston	1936	....	....	....	....	139,667	6,560	Miocene
Hamel, Colorado	1945	5	....	5	265	132,540	9,030	Wilcox
Hamman, Matagorda	1936	2	15	17	555	4,963,477	8,100-9,250	Frio
Hampton, Hardin	*1942	....	....	....	....	54,242	6,945	Yegua
Hankamer, Old, Liberty	1929	3	19	22	355	6,473,552	2,580	Miocene; 5,460 Frio
Hankamer, New, Liberty	1935	2	3	5	180	1,068,943	8,497-8,505	Frio
Hardin, Liberty	1935	18	58	76	1,445	12,623,487	7,450-7,645	Frio
Hastings, Brazoria	1934	610	48	658	53,020	128,943,587	5,400-6,000	Frio
Hawkinsville, Matagorda	*1936	....	....	....	....	2,000	5,150	Miocene
High Island, Galveston	1922	26	40	66	2,935	22,565,643	2,900	Miocene; 6,250 Frio
Hillje, Wharton	1939	4	13	17	505	1,229,114	5,230-6,545	Frio
Hillje, South, Wharton	1945	6	....	6	255	107,966	5,225	Marg.
Hitchcock, Galveston	1937	10	7	17	895	1,914,767	1,563-5,155	Miocene
Hockley, Harris	1923	.....	1	1	50	67,545	6,356-66	Yegua, Cockfield
Hoskins Mound, Brazoria	*1904	....	....	....	....	32,000	600	Caprock (sulfur production)
Hull, Liberty	1918	8	143	151	3,275	102,448,139	400	Caprock; 700-2,250 Mio.; 3,040-4,360 Frio; 6,375-7,200 Yegua
Hall's Bayou, Brazoria	1943	....	....	....	cond.	.....	10,270	Frio
Humble, Harris	1905	8	182	190	2,170	130,877,799	2,824-40	Miocene; 4,836-90 Frio; 5,050-78 Yegua
Hutchins, Wharton	1946	7	....	7	235	62,838	4,520	Oligocene
Hyatt, South, Tyler	1945	1	....	1	25	45,906	8,380	Wilcox
Hungerford, Wharton	1944	....	....	....	gas	.....	3,030	Catahoula
Inglehart, Colorado	*1945	....	....	....	cond.	.....	8,785	Wilcox
Jackson Pasture, Chambers	1943	2	....	2	30	66,036	9,000	Frio
Joe's Lake, Tyler	1937	22	16	38	600	4,862,316	4,700	Yegua; 7,650-7,750 Wilcox
Josey Ranch, Harris	1945	....	....	....	cond.	.....	6,955	Yegua
Joyce Richardson	1940	7	....	7	195	393,870	6,900	Yegua
Katy, Waller	1935	....	....	....	gas	.....	6,850-7,335	Yegua
Katy, North, Waller	1943	51	....	51	1,465	1,347,928	6,620-6,860	Yegua
Kirby, Liberty	1943	17	....	17	635	829,813	8,325-8,430	Yegua
Kubela, Wharton	1936	9	10	19	705	2,188,663	4,680	Frio
Lissie, Wharton	1940	....	....	....	cond.	.....	6,444-6,606	Yegua; 9,550 Wilcox
Lake View, Wharton	1936	....	....	....	gas	.....	3,210	Catahoula; 3,875 Marg.
LaBelle, Jefferson	1937	8	....	8	1,220	1,756,795	6,530	Marg.; 8,220 Frio
Lake Creek, Montgomery	1941	3	....	3	55	151,376	8,820-11,800	Wilcox
Lane City, Wharton	1944	13	....	13	465	363,582	5,345	Frio
League City, Galveston	1938	13	12	25	1,460	5,850,408	9,105-10,603	Frio
Liverpool, Brazoria	1946	....	....	....	....	1,566	8,760	Frio
Livingston, Polk	1932	71	59	130	5,000	11,733,768	4,200	Yegua; 6,150 Sparta; 7,020 Wilcox
Lochridge, Brazoria	1936	31	4	35	1,515	6,562,842	6,360	Frio
Lost Lake, Chambers	1929	....	2	2	3	1,047,620	2,700	Marg.; 2,800 Frio
Louise, Wharton	1933	3	25	28	675	5,237,618	2,970	Yegua; 5,150-6,457 Frio
Lovell's Lake, Jefferson	1938	104	9	113	3,775	11,798,426	7,300	Marg.; 7,700-7,810 Frio
Lovell's Lake, No., Jefferson	1944	4	....	4	180	155,878	7,175	Frio
Lucky, Matagorda	1941	3	....	3	280	.....	7,900-10,175	Frio
Magnet-Withers, Wharton	1936	171	77	248	7,120	24,819,845	4,000-5,565	Frio
Magnolia, Montgomery	1941	....	....	....	cond.	1,682	8,448	Wilcox
Manvel, Brazoria	1931	74	69	143	6,770	34,757,630	3,871-4,200	Miocene; 4,200-5,800 Marg.-Frio
Markham, Matagorda	1908	11	20	31	675	9,901,892	2,300-3,600	Catahoula; 3,730-4,010 Frio
Markham, North, Matagorda	1938	40	....	40	3,015	5,610,843	7,702-8,390	Frio
Martha, Liberty	1939	1	9	10	375	1,149,721	8,090-8,160	Yegua







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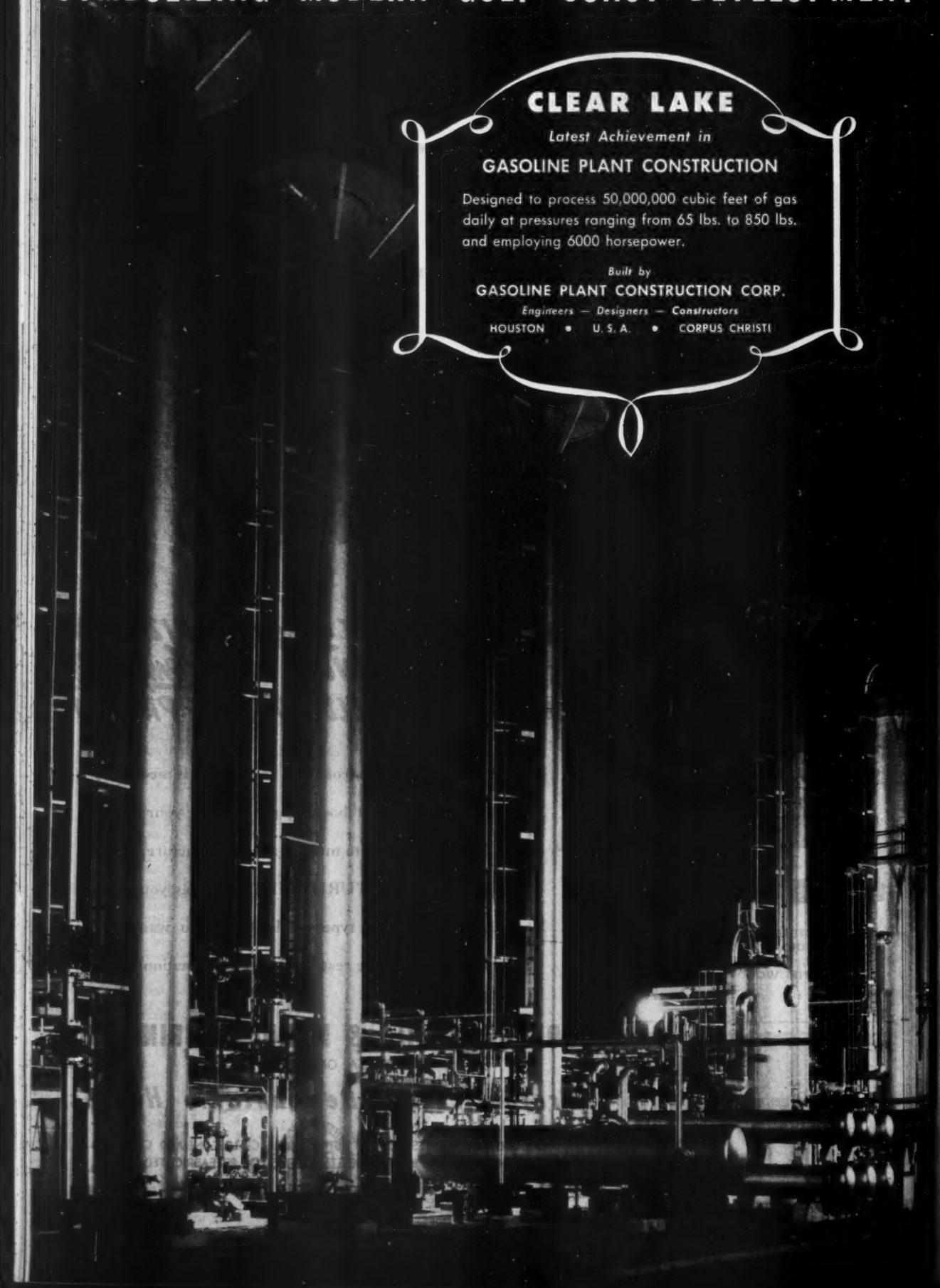

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TEXAS RAILROAD COMMISSION DISTRICT 3—(Continued)

Field and County—	Year of discovery	Oil-producing wells: Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Mayes, Chambers	1944	6	....	6	255	275,755	8,200	Frio
Mayes, South, Chambers	1946	2	....	2	65	14,355	9,200	Frio
McCoy, Liberty	1946	4	....	4	215	56,836	9,115	Wilcox
McCrary, Fort Bend	1946	....	....	....	....	407	.....	
Mercy, San Jacinto	1942	29	7	36	2,410	4,259,514	8,265	Wilcox
Midfields, Matagorda	1946	5	....	5	540	161,116	9,135	Frio
Moss Bluff, Liberty-Chambers	*1929	....	....	....	....	179,000	781	Caprock; 5,500-5,860 Mid. Olig.
Mykawa, Old, Harris	1929	....	1	1	25	1,010,975	4,300	Marg.; 4,900 Frio
Mykawa, New, Harris	1930	....	18	18	235	4,049,488	.....	
Millican, Brazos	1942	....	....	....	gas	.....	3,345	Wilcox
Matzke, Wharton	*1945	....	....	....	gas	.....	5,780	Frio
Menefee, Wharton	1943	....	....	....	gas	.....	4,550-5,250	Frio
Mustang, Jackson	....	....	....	....	....	2,568	.....	
Nada, Colorado	1944	....	....	....	gas	.....	6,520	Yegua
Nash Dome, Fort Bend	1926	2	....	2	30	1,698,957	5,865	Frio
Needville, Fort Bend	1941	19	1	20	905	781,156	3,950	Miocene; 5,169-6,546 Frio
New Ulm, Austin	1945	1	....	1	30	17,149	9,151	Wilcox
Nome, Jefferson	1936	3	32	35	650	4,771,434	4,700	Miocene; 6,025 Marg.
North Dayton, Liberty	1905	....	....	....	....	2,382,762	400-1,100	Caprock and Mio.; 4,075-5,188 Vicksburg
North Houston, Harris	1938	4	....	4	150	398,947	6,760-7,480	Yegua
North Louise, Wharton	1943	....	....	....	gas	.....	2,977	Miocene; 4,160 Frio
North Delhi, Harris	1945	....	....	....	gas	.....	7,042-7,291	Yegua
North Vidor, Orange	1947	....	....	....	cond.	.....	7,780	Frio
Old Ocean, Brazoria	1934	82	3	85	9,765	22,259,146	8,654-11,000	Frio
Olive, Hardin	1945	4	....	4	230	107,252	10,025	Wilcox
Orange (incl. Bland), Orange	1913	....	35	35	250	33,509,758	2,000-5,200	Miocene; 5,570-90 Het.; 5,600-25 Frio
Orange, West, Orange	1937	3	24	27	520	4,296,359	.....	
Orange Hill, Austin	*1942	....	....	....	gas	.....	9,070	Wilcox
Orange Hill, W., Colorado	*1945	....	....	....	....	195	8,380	Wilcox
Oyster Bayou, Chambers	1941	21	....	21	6,020	8,156,155	7,580-8,280	Frio
Orchard (Moore's), Fort Bend	1926	3	3	6	160	3,846,124	1,200	Miocene; 4,000 Frio; 7,340 Yegua
Palacios, Matagorda	1937	1	....	1	10	34,037	7,580-8,810	Frio
Pickett Ridge, Wharton	1935	15	31	46	1,310	5,526,172	4,600-4,790	Frio
Pierce Junction, Harris	1921	12	35	47	1,140	37,443,398	3,100	Miocene; 6,725 Frio-Vicksburg
Pinehurst, Montgomery	1943	....	....	....	....	124,840	8,750-9,735	Wilcox
Pledger, Brazoria	1932	....	....	....	cond.	.....	6,540-6,675	Frio
Port Neches, Orange	1929	5	20	25	860	6,521,148	2,300	Pliocene; 3,110 Miocene; 5,800 Frio
Port Neches, N., Orange	1946	4	....	4	215	21,613	.....	
Port Neches, W., Orange	1939	14	12	26	1,015	2,560,072	.....	
Raccoon Bend, Austin-Waller	1928	27	124	151	7,135	38,375,522	3,150-4,152	McElroy-Yegua
Ramers Island, Tyler	1942	1	1	2	95	173,871	5,390-5,401	Yegua
Red Fish Reef, Chambers	1940	20	....	20	1,875	3,164,752	9,600-10,985	Frio
Richardson, Joyce (Ogburn), Harris	1940	....	....	....	....	.....	6,650-6,940	Cockfield
Rockland, Old, Jasper	*1928	....	....	....	....	43,704	1,275	Yegua
Rockland, New, Tyler	*1944	....	....	....	....	454	.....	
Ramsey, Colorado	1943	....	....	....	cond.	.....	8,320-8,970	Wilcox
Rock Island, Colorado	1945	....	....	....	cond.	.....	9,680	Wilcox
Rosenburg, Fort Bend	1939	....	1	1	25	24,832	7,710	Yegua
Rosslyn, Harris	1938	....	....	....	....	47,007	6,950	Yegua
Rowan, Brazoria	1940	8	....	8	730	1,356,565	8,550-8,978	Frio
Sealy, Austin	1942	....	....	....	cond.	.....	8,750	Wilcox
Sabine Pass, Jefferson	*1941	....	....	....	....	10,218	4,990	Miocene
Sabine Tram, Newton	1946	....	....	....	cond.	746	7,960	
Sandy Point, Brazoria	1937	....	3	3	80	426,718	6,480	Marg.
Saratoga, Hardin	1901	12	183	195	1,145	30,914,526	500	Miocene; 1,225 Marg.; 3,300 Frio; 5,850-6,700 Yegua
Satsuma, Harris	1936	11	3	14	830	1,499,631	7,260	Yegua
Schwab (Ace), Polk	1933	3	1	4	175	792,568	4,800	Yegua; 7,785 Wilcox
Seabreeze, Chambers	1936	16	....	16	1,440	2,698,596	8,480	Frio
Segno, Polk	1936	35	74	109	3,435	12,306,175	5,150	Yegua; 8,150 Wilcox
Shepherds Mott, Matagorda	*1936	....	....	....	gas	1,000	3,850	Catahoula
Sheridan, Colorado	1940	2	....	2	75	332,514	9,310-10,400	Wilcox
Silsbee, Hardin	1936	35	12	47	2,565	6,722,238	6,800-6,960	Yegua
Silsbee, W., Hardin	1941	3	1	4	175	174,819	6,380	Yegua
Smith's Point, Chambers	1944	11	....	11	1,920	1,188,048	8,140	Frio
Sour Lake, Hardin	1902	30	110	140	2,170	82,855,965	700	Miocene; 2,600 Marg.; 4,525 Frio; 5,200 Yegua
South Houston, Harris	1935	38	41	79	4,080	14,447,488	770	Caprock; 4,875 Frio
South Liberty, Liberty	1925	8	34	42	430	16,581,042	765	Mio.; 3,460-3,600 Frio; 4,600 Cook Mt.
Spindletop, Jefferson	1901	3	107	110	625	128,258,131	800-1,200	Caprock and Mio.; 4,000-5,879 Middle Olig. and Frio
Splendora, Montgomery	*1934	....	....	....	gas	1,000	5,820	Yegua
Spring, Harris	1944	6	....	6	175	172,333	6,240	Yegua
Spurger, Tyler	1932	....	1	1	15	108,997	4,685-4,928	Yegua
Stowell-Winnie, Jefferson	1941	89	3	92	13,070	19,441,533	7,160	Marg.; 7,400-8,960 Frio
Stratton Ridge, Brazoria	1922	2	....	2	90	52,798	3,960	Miocene
Sublime, Colorado	1944	3	....	3	145	81,343	9,445-9,530	Wilcox
Shepherd, San Jacinto	1940	....	....	....	cond.	.....	8,235	Wilcox
Sugarland, Fort Bend	1928	22	21	43	4,280	40,540,414	2,925	Miocene; 3,925 Marg.-Frio
Sugar Valley, Matagorda	1943	34	....	34	2,830	431,862	7,674-9,970	Frio; 10,695 Vicksburg
San Felipe, Waller	1934	....	....	....	....	22,420	2,970	Frio
Spanish Camp, Wharton	1936	....	....	....	gas	.....	2,960-3,005	Catahoula; 3,750 Marg.
Sam Houston, Walker	1946	....	3	3	25	4,139	.....	
Thompson, Fort Bend	1931	157	59	216	25,760	81,717,096	5,200-25	Marg.; 5,300-25, 5,375-5,400 Frio; 7,830-49 Vicksburg
Thompson, N., Fort Bend	1939	53	....	53	5,425	5,313,264		
Thompson, S., Fort Bend	1939	75	5	80	6,790	13,552,350		

TEXAS RAILROAD COMMISSION DISTRICT 3—(Continued)

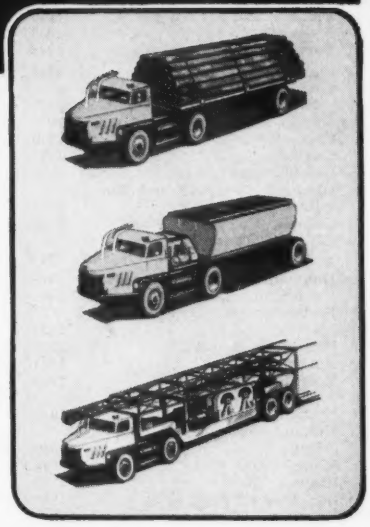
Field and County—	Year of discovery	Oil-producing wells: Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Tide Haven, Matagorda	1946	1	....	1	120	18,766	8,450	Frio
Tomball, Harris-Montgomery	1933	218	209	427	8,525	37,720,917	5,560	Yegua
Turtle Bay, Chambers	1935	14	16	30	1,000	4,404,151	6,585	Frio
Turtle Bay, E., Chambers	1943	1	2	3	155	205,511	.....	
Tide Haven, S., Matagorda	1947	1	....	1	15	875	.....	
Village Mills, Hardin	1944	2	1	3	95	91,526	5,800	Yegua
Webster (Friendswood), Harris	1937	186	20	206	52,255	86,805,452	5,100	Marg.; 5,415-5,580 Frio
West Columbia, Brazoria	1915	53	97	150	6,055	101,213,323	600-8,250	Plio.-Mio. and Marg.-Frio
Willow Slough, Chambers	1937	6	....	6	155	849,277	8,685-9,485	Frio
Willis (Weir Creek), Montgomery	1945	....	....	....	....	462	3,760	Yegua
Winnie, Jefferson	1943	(see Stowell)						
Winnie, N., Chambers	1944	1	....	1	60	67,172	8,750-10,850	Frio
Withers, North, Wharton	1940	101	54	155	6,550	16,644,902	.....	
Wilson Creek, Matagorda	1937	....	....	....	cond.	.....	9,831-10,020	Frio
Total		4,924	3,187	8,111	441,161	2,064,733,690		

*Abandoned.

TEXAS RAILROAD COMMISSION DISTRICT NO. 4

Adami, Webb	1939	....	52	52	115	738,993	980	Jackson
Agua Dulce, Nueces-Jim Wells	1928	183	16	199	10,883	14,939,529	6,300-7,200	Yegua
Agua Prieta, Duval	1941	7	5	12	330	298,955	4,060	Jackson; 4,315-4,710 Yegua
Alamo, Hidalgo	*1942	....	....	....	....	.....	5,505-5,953	Frio
Albercas, Webb	1928	....	....	....	....	2,547,611	2,130	Cole, Eocene
Albercas, N., Webb	1945	....	4	4	130	55,201	2,315	Mirando
Alfred, Jim Wells	1938	10	5	15	305	1,134,743	3,212-3,350	Frio; 4,685 Vicksburg
Alice, Jim Wells	1938	13	24	37	995	4,681,804	3,495-5,475	Frio
Alta Mesa, Brooks	1936	1	37	38	1,190	2,877,032	2,400	Catahoula
Alta Verde, Brooks	*1936	....	....	....	....	6,667	900	Miocene
Alworth, Zapata-Jim Hogg	*1927	....	....	....	....	27,000	.....	
Angelita, San Patricio	*1934	....	....	....	....	29,214	5,380	Frio
Aransas Pass, Aransas-San Patricio	1936	13	40	53	2,325	15,980,050	6,500	Frio
Armstrong, Jim Hogg	1943	22	8	30	900	962,977	3,250	Loma Novia; 3,650 Pettus (gas)
Aviators, Webb	1922	....	95	95	630	6,672,611	1,800	Dulup; 2,400 Jackson
Alta Mesa, East, Brooks	1944	....	....	....	....	.....	7,630	Frio
Almond, Jim Wells	1944	....	....	....	gas	.....	3,225	Frio-Vicksburg
Andrews, Webb	1946	....	....	....	gas	.....	1,500-1,560	Jackson sand
Armagosa, Jim Wells	1930	....	....	....	gas	.....	2,200-2,350	Frio
Beasley, San Patricio	1946	....	....	....	cond.	.....	4,900	Vicksburg
Boedecker, Brooks	1944	....	....	....	....	.....	6,265	Frio
Baffins Bay, Kleberg	*1940	....	....	....	....	3,593	.....	
Baldwin (S. Saxet), Nueces	1935	2	19	21	725	1,517,475	3,200	Oakville; 3,900-4,055 Catahoula
Bandera, Jim Wells	*1939	....	....	....	....	1,532	.....	
Barbacoas, Starr	*1943	....	....	....	....	35,547	.....	
Benavides (N. Sweden), Duval	1937	50	125	175	2,850	16,694,930	3,900-4,800	Jackson; 5,600-10 Yegua
Benavides, E., Duval	1941	1	....	1	60	94,302	4,915	Jackson
Ben Bolt, Jim Wells	1939	38	15	53	1,405	4,688,130	4,500-5,330	Frio; 5,414 Vicksburg
Ben Bolt, 4,500-ft. sand, Jim Wells	*1941	....	2	2	15	175,065	.....	
Bird Island, Kleberg	1938	1	....	1	10	54,606	7,210	Frio
Blanchard, Duval	*1939	....	....	....	....	56,234	.....	
Blucher, Jim Wells	1939	8	1	9	855	437,474	6,062-6,190	Frio; 7,520 Vicksburg
Borregas, Kleberg	1945	3	....	3	105	7,793	6,980	Frio
Boyle, Starr	1940	18	8	26	670	1,076,604	3,490	Frio; 3,945 Vicksburg
Brayton, Nueces	1944	22	1	23	1,005	591,434	6,620-7,240	Frio
Bridwell, Duval	1940	3	8	11	115	395,582	4,305	Pettus
Brownlee, Jim Wells	1944	1	....	1	2	9,705	4,950	Vicksburg
Bruni, Webb	1934	1	3	4	25	2,480,681	3,405	Yegua
Bruni, East, Webb	1937	....	1	1	5	388,660	3,425	Yegua
Bruni, South, Webb	1944	....	3	3	10	11,718	1,800	Cole sand
Cage, Brooks	1946	....	....	....	cond.	.....	8,030	Vicksburg
Cam, Duval	1947	....	....	....	gas	.....	3,320	Frio
Canales, Jim Wells	1944	....	....	....	....	.....	7,230	Frio
Cadena, Duval	1942	10	8	18	515	687,356	3,460	Frio; 4,275-4,554 Jackson; 5,110-5,530 Yegua
Camada, Jim Wells	*1939	....	....	....	....	4,890	5,627	Cockfield
Cameron, Starr	1943	22	4	26	1,155	975,927	4,100	Frio
Captain Lucey (Bentonville), Jim Wells	1936	2	4	6	55	620,545	3,978-5,392	Frio; 5,655 Vicksburg
Carolina-Texas, Webb	*1921	....	....	....	....	262,402	.....	
Casa Blanca, Duval	1938	....	51	51	490	1,477,923	1,000-1,212	Jackson
Casa Blanca, North, Duval	1939	....	9	9	115	269,746	1,050-1,754	Jackson
Casa Blanca, West, Duval	1941	....	15	15	170	409,758	994	Jackson
Cedro Hill, Duval	1938	5	71	76	835	2,014,905	900	Frio; 1,430-1,534 Jackson
Chapman Ranch, New, Nueces	1941	1	3	4	80	127,573	.....	
Chapman Ranch, Old, Nueces	*1937	....	....	....	....	41,511	4,275	Catahoula
Charamousca, Duval	1935	....	17	17	165	910,004	990	Cole; 1,450-1,525 Mirando
Charamousca, S., Duval	1941	....	13	13	100	286,753	1,525	Cole
Charco Redondo, Zapata	1913	....	21	21	1	164,683	450	Jackson; 1,830 Cockfield
Charco Redondo, E., Zapata	1945	....	4	4	120	11,563	1,680	Mirando
Chiltipin, Duval	1939	....	....	....	....	61,079	4,725-4,800	Pettus
Clara (Bruce), Duval	1943	....	1	1	2	6,827	3,770	Pettus
Clara Driscoll, Nueces	1935	4	13	17	465	1,964,917	3,800	Catahoula; 4,650-6,550 Frio
Clara Driscoll, S., Nueces	1937	24	50	74	1,275	6,328,556	3,900	Catahoula
Clark-Muil, Jim Wells	*1939	....	....	....	....	49,819	.....	
Cole, West and East, Webb	1927	....	64	64	290	5,322,635	1,725-1,820	Jackson

How to HAUL HEAVY EQUIPMENT THROUGH *"impossible"* TERRAIN



How WALTER "Mechanical Brain" concentrates wheelpower where needed, when needed.

● In the Walter 4-Point Positive Drive System, three automatic locking differentials act like a "mechanical brain", proportioning power to each wheel according to its traction at any instant. If one, two, even three wheels lost traction, power is automatically concentrated on the working mates. No power is wasted on helpless, spinning wheels; no bogging down on soft or slippery surfaces.

ADDITIONAL sources of oil must come through deeper drilling or from new locations. This means bigger, heavier equipment to be hauled—tougher running conditions to overcome.

In such severe conditions, Walter Tractor Trucks work at their best, putting into full operation the unique Walter 4-Point Positive Drive. Tremendous power and traction are available at all times, enabling you to haul bigger rigs and loads through soft dirt, mud, sand, snow, slippery surfaces, steep grades.

By carrying bigger loads, you can use fewer trucks, make fewer trips. Traveling time is cut because Walter Tractor Trucks maintain steady speeds in bad running conditions. There are no costly delays caused by bogging down and stalling.

Put the high power and traction of Walter Tractor Trucks on your toughest off-the-road jobs. They feature many engineering advancements especially designed for this gruelling hauling. Write today for literature giving the complete story.

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WALTER
TRACTOR TRUCKS

TEXAS RAILROAD COMMISSION DISTRICT 4—(Continued)

Field and County—	Year of discovery	Oil-producing wells— Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Colorado, Jim Hogg	1936	92	145	237	4,290	5,549,663	3,020	Cockfield
Comitas, Zapata	1934	....	120	120	195	2,023,539	800-1,000	Mirando
Conoco-Driscoll, Duval	1924	39	23	62	2,495	8,939,129	3,020-3,600	Jackson
Corpus Christi, Nueces	*	....	....	....	....	6,763,621	.....	
Cuellar, Zapata	1927	....	16	16	20	2,677,026	1,300	Mirando
Colmena, Duval	1934	....	21	21	95	695,604	1,486	Cole
Dinn, Duval	1942	....	....	....	gas	.....	2,480	Jackson
Dan Sullivan, Brooks	1944	1	....	1	1	4,799	8,510	Frio
Dougherty, Nueces	1944	....	....	....	....	9,482	5,410	Vicksburg; 5,560 Frio
Dulup, Webb	1943	....	16	16	270	329,573	1,810	Dulup sand
Driscoll, North, Duval	1946	1	....	1	30	13,514	3,160	Government Wells sand
Eagle Hill, South, Duval	1944	....	....	....	....	.....	2,070	Jackson
Eagle Hill, Duval	1933	....	50	50	415	2,467,959	1,500-2,069	Jackson
East, Jim Hogg	1942	9	1	10	190	241,921	3,985	Hockley; 4,735 Pettus
El Tanque (S. Ricaby), Starr	1937	....	7	7	35	481,487	430	Frio
Escobas, Zapata	1929	....	204	204	505	8,698,029	1,000-1,400	Mirando
Echols, Zapata	1945	....	....	....	gas	.....	1,948	Queen City
East Falfurrias, Jim Wells	1945	....	....	....	cond.	.....	9,030	Vicksburg
Fitzsimmons, Duval	1938	22	38	60	640	3,771,024	3,600	Hockley; 4,250 Mirando; 4,350 Pettus
Fitzsimmons, E., Duval	1940	....	....	....	....	485	.....	
Flores, Starr	1945	....	1	1	5	7,385	5,850	Vicksburg
Flour Bluff, Nueces	1936	37	28	65	1,695	11,049,221	6,650	Marg.
Flour Bluff, E., Nueces	1940	19	....	19	895	1,868,034	6,800	Marg.
Frost, Starr	1942	....	1	1	2	8,612	4,185	Frio
Farenthold, Geo., Nueces	1946	5	....	5	505	27,704	5,605	Frio
Gallagher, Jim Wells	1940	4	....	4	145	287,062	5,205	Frio; 5,755 Vicksburg
Gandy (Driscoll Ranch), Nueces	1939	3	6	9	120	512,284	.....	
Garcia, Starr	1942	80	6	86	3,810	3,120,688	3,745	Frio
Glen, Webb-Zapata	1940	3	52	55	545	2,294,973	2,180	Cockfield
Gormac, Duval	1945	4	6	10	270	179,434	2,475	Loma Novia
Government Wells, N., Duval	1928	15	571	586	5,565	59,398,963	2,900	Yegua; 1,550-2,300 Jackson
Gregory, Live Oak and San Patricio	1944	....	....	....	....	13,731	8,500	Frio
Guerra (Cuevitas), Starr	1933	6	5	11	525	2,056,027	2,255	Hockley
Gly Hill (Loma Blanca), Brooks	1945	1	2	3	10	10,455	6,660	Frio
Haldeman, So., Jim Wells	1947	1	....	1	35	908	.....	
Haldeman (Seelig), Jim Wells	1941	1	1	2	25	64,109	3,710-5,035	Frio
Henne-Winch-Farris, Jim Wells	*1924	....	....	....	....	3,215,204	.....	
Henshaw, Jim Wells	1940	1	....	1	45	115,316	3,778-5,136	Frio
Herbst, Duval	1944	....	3	3	....	39,899	2,830	Jackson
Hoffman, Duval	1933	....	292	292	2,770	14,588,225	2,400-2,850	Govt. Wells, Loma Novia, Guellar
Holbein, Jim Wells	1940	....	9	9	105	163,564	2,800	Pettus
Holland-Hebbronville, Jim Hogg	*1940	....	....	....	....	1,348	.....	
Howell, Jim Wells	*1944	....	....	....	....	.....	.....	
Hughes, Webb	1946	....	11	11	195	19,153	1,870	Jackson sd., Eocene
Ira, Starr	1945	1	....	1	10	7,454	3,925	
Jennings, Zapata	1914	....	75	75	565	3,544,780	900-1,500	Yegua
Holland (Bennett), Starr	1946	2	1	3	80	17,310	2,960	Vicksburg
Hirsch, Webb	1946	....	....	....	gas	.....	6,905-7,020	Wilcox
Jakalak, Starr	1944	....	....	....	gas	.....	1,828	Frio
Jones, Jim Hogg	1941	....	....	....	gas	.....	4,210	Govt. Wells; 5,904 Frio
Kelsey, Brooks, Jim Hogg and Starr	1938	77	13	90	2,040	5,170,104	4,720	Frio
Kelsey (Deep Zone), Jim Hogg and Brooks	....	61	....	61	2,440	1,099,308	5,171-6,485	Yegua
Killam, Webb	1937	....	65	65	155	1,515,814	2,010	Jackson
Killam, N., Webb	1938	....	3	3	10	110,560	2,010	Jackson
Kingsville, Kleberg	1920	2	1	3	45	808,607	2,910	Miocene
Kohler, Duval	1926	....	9	9	50	744,407	1,750-1,815	Cole; 2,350-2,628 Mirando
Koopman, Jim Wells	1942	....	1	1	5	37,267	4,113-5,690	Frio
Kreis, Duval	1940	....	10	10	85	242,484	3,200-3,315	Jackson
Lapena, Zapata	1934	....	....	....	gas	.....	2,300	Queen City
Landa, Hidalgo	1946	....	....	....	cond.	.....	8,385	
Lacy, Hidalgo	1947	....	1	1	30	2,564	7,983	
La Blanca, Hidalgo	1936	....	....	....	....	.....	6,550-8,000	Frio
Labbe, Duval	1937	....	9	9	85	594,820	2,800-2,900	Jackson
La Gloria, Jim Wells	1939	38	3	41	2,100	1,120,466	6,700	Frio
Lamar, Aransas	1937	....	....	....	....	1,092	.....	
La Reforma, Starr	1938	2	....	2	80	38,977	5,925	Vicksburg
La Sal Vieja, Willacy	1936	....	....	....	....	15,000	7,550	Frio
Las Animas, Jim Hogg	1937	....	8	8	20	105,310	1,775	Cole
Las Mujeras, Jim Hogg	1944	....	....	....	....	3,220	5,130	Pettus
Lefevre, Jim Hogg	1945	....	2	2	20	6,151	1,770	Cole
Laurel, Webb	1932	....	....	....	....	630,632	2,155	Jackson
Lockhart, Starr	1943	8	4	12	250	417,771	3,620	Frio
Loma Novia, Duval	1934	51	385	436	2,920	32,011,175	2,610	Loma Novia, Mirando
Loma Vista, Duval	1936	....	....	....	....	19,999	2,915	Loma Novia
London, Nueces	1937	....	3	3	45	162,628	4,700	Catahoula
Longhorn, Duval	1938	9	24	33	715	3,274,471	4,080	Cole; 4,405 Govt. Wells
Longhorn, E., Duval	1945	16	....	16	960	528,373	5,840	Pettus
Lopez, Duval-Webb	1935	....	272	272	1,760	15,874,045	2,155	Mirando
Los Indios, Hidalgo	*1944	....	....	....	....	.....	.....	Frio
Los Olmos, Starr	1925	....	65	65	45	697,630	250-440	Frio
Luby, Nueces	1937	121	10	131	2,575	12,939,622	5,170-7,436	Frio
Lundell, Duval	1937	20	67	87	975	2,951,716	1,540	Cole

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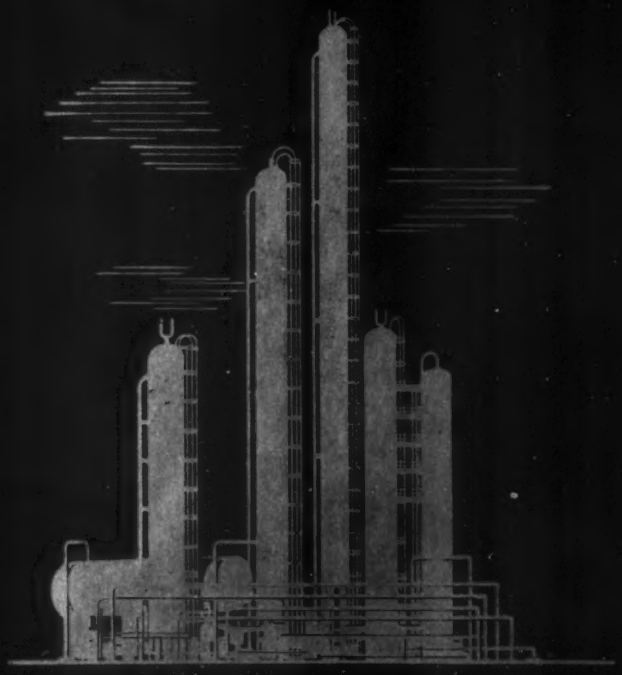

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Engineers and Constructors

FAIRVIEW STATION • HOUSTON, TEXAS

TEXAS RAILROAD COMMISSION DISTRICT NO. 4—(Continued)

Field and County—	Year of discovery	Oil-producing wells: Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Lykes, Webb	1942	....	....	....	....	2,139	1,950	Yegua
McGill, Kenedy	1947	1	....	1	50	1,396	7,672	
McDermott, Zapata	*1945	....	....	....	....	.....	2,630	Queen City
McCampbell, Aransas-San Patricio	1936	....	....	....	....	.....	6,550-7,484	Frio
McAllen, Hidalgo	1938	....	....	....	....	.....	6,900-7,900	Frio
McLean, Webb	1942	....	9	9	235	364,338	3,220	Yegua
Magnolia City, Jim Wells	1939	3	1	4	80	500,978	5,611-5,708	Frio-Vicksburg
Magnolia City, N., Jim Wells	1943	29	2	31	1,385	1,580,316	3,626-5,411	Frio
Magnolia City, W., Jim Wells	1946	....	....	....	....	.....	3,752-5,410	Frio
Manila, Jim Hogg	1940	....	5	5	30	388,154	2,610	Cockfield
Mariposa, Brooks	1945	5	....	5	100	50,918	6,660	Frio-Vicksburg
Mathis, E., San Patricio-Live Oak	1940	....	....	....	....	14,391	4,405	Frio-Vicksburg
Midway, San Patricio	1937	39	40	79	3,280	7,281,938	5,300-6,260	Frio
Minne Bock, Nueces	1939	6	55	61	1,650	4,552,592	3,800	Catahoula; 5,560 Frio
Minne Bock, N., Nueces	1946	9	....	9	670	110,531	6,100-8,250	Frio
Mirando City, Webb	1921	....	34	34	150	9,648,013	1,690	Jackson
Mirando Valley, Zapata	1921	....	14	14	20	1,597,942	1,430	Mirando; 1,825-35 Cockfield
Moca, Webb	1932	4	7	11	95	1,376,975	870	Jackson
Monte Negra, Kleberg	1945	1	....	1	....	28,078	7,060	Frio
Maedgen, San Patricio	1945	....	....	....	....	.....	4,190	Frio
Mercedes, Hidalgo	1935	....	....	....	....	.....	7,435	Frio
Neuhaus, Jim Hogg	1942	3	4	7	35	85,811	3,469	Cockfield
Nichols, Hidalgo	1940	4	3	7	110	514,148	3,650	Frio
Naylor, Jim Wells	1945	....	....	....	....	.....	3,975	Frio
Odem, San Patricio	1939	68	5	73	1,870	3,351,984	3,535	Catahoula; 5,325-7,000 Frio
Odem, N., San Patricio	1944	....	....	....	....	4,338	5,435	Frio
O'Hern, Duval-Webb	1936	....	137	137	1,280	13,020,592	2,855	Cockfield
Oilton, Webb	1937	....	29	29	80	1,857,751	1,905	Mirando
Orange Grove, Jim Wells	1940	18	4	22	760	2,802,364	5,048-5,119	Frio
O'Neil, San Patricio	1943	....	....	....	....	.....	6,855	Frio
Patel, Jim Hogg	1940	....	....	....	gas	.....	3,124	Cockfield
Palangana, Duval	1946	....	....	....	gas	4,000	1,690	Upper Miocene
Penitas, Hidalgo	1942	....	....	....	....	.....	5,923-6,038	Vicksburg
Peters, Duval	1933	1	3	4	50	308,943	1,760	Cole; 2,410 Argo; 2,630 Mirando
Peters, E., Duval	1940	1	3	4	22	59,039	2,557	Govt. Wells
Petronilla, Nueces	1941	15	2	17	425	774,121	6,950-8,115	Frio
Piedre Lumbre, Duval	1935	....	121	121	1,585	6,380,933	1,350	Frio; 1,960 Cole; 2,100 Charnosky
Piedras Pintas, Duval	1925	26	....	26	1,965	586,549	3,450	Catahoula; 3,796-3,819 Govt. Wells
Pita, Brooks	1945	4	....	4	402	78,987	7,112-8,029	Frio
Plymouth, San Patricio	1935	147	32	179	8,665	39,559,808	5,500-6,157	Frio
Premont, Jim Wells	1933	1	1	2	34	854,956	2,250-3,718	Frio
Premont Prospect, Jim Wells	1941	....	2	2	21	48,545	.....	
Paso Real, Willacy	1946	....	....	....	cond.	.....	8,590	
Quinto Creek, Jim Wells	1942	1	1	2	100	152,703	4,860-5,130	Frio
Rachal, Brooks	1945	1	....	1	20	8,618	6,155	Frio
Rancho Solo, Duval	1935	....	17	17	50	365,956	1,800	Cole; 2,560 Govt. Wells
Rancho Solo Extension, Duval	1940	1	6	7	45	246,488	.....	
Randado, Jim Hogg	1926	....	83	83	155	5,113,507	1,260	Cole
Raymondville, Willacy	1945	2	....	2	40	25,349	6,390	Frio
Reynolds, Jim Wells	1939	11	9	20	415	1,827,034	3,145-5,187	Frio
Ricaby, Starr	1937	....	9	9	70	236,619	1,300-1,400	Frio
Ricardo, Kleberg	1945	1	....	1	15	52,246	7,250	Frio
Richard King, Nueces	1937	86	....	86	3,085	6,535,523	4,000-5,600	Vicksburg
Richardson, Duval	1944	....	4	4	35	22,959	1,780	Jackson
Rincon (incl. Parsons), Starr	1938	135	23	158	5,910	13,795,094	3,500-4,200	Frio
Rincon, N. (incl. No. Parsons), Starr	1939	31	15	46	1,575	1,616,824	3,890-4,550	Frio; 5,650-6,635 Vicksburg
Rio Grande City, Starr	1932	....	8	8	25	418,819	1,375	Frio
Rios, Duval	*1944	....	....	....	....	.....	.....	
Riverside and East, Nueces	1938	14	....	14	455	480,856	5,000-6,950	Frio
Robinson (E. Fitzsimmons), Duval	1943	7	1	8	410	205,830	4,655	Frio
Robstown, Nueces	1939	2	....	2	25	196,966	5,200-7,155	Frio
Rodriguez, Starr	*1941	....	....	....	....	40	.....	
Roma, Starr	*1928	....	....	....	....	17,308	.....	
Rooke, Refugio	1942	15	....	15	590	793,559	7,140	Vicksburg
Rosalia, Duval	1945	(see North Driscoll)			gas	.....	3,160	Govt. Wells
Rosita (Reyes), Duval	1944	....	3	3	25	90,231	7,460	Frio
Ross, Starr	1943	11	31	42	1,120	1,025,724	2,430-2,860	Frio
S.R.C., Duval	*1930	....	....	....	....	203,000	.....	
Ramon, Jim Wells	1945	....	....	....	....	.....	4,375	Frio
Retamia, Webb	1933	....	....	....	....	.....	2,250-3,720	Frio
Rivieria, Kleberg	1945	....	....	....	....	.....	7,460	Frio
Round Lake, San Patricio	1946	1	....	1	15	1,890	5,445	
Santa Maria, Hidalgo	1945	....	....	....	....	.....	8,860	Frio
San Fordyce, Starr-Hidalgo	1934	....	18	18	135	7,566,964	2,750-5,900	Frio
Santa Elena, Starr	....	(see North Sun)			....	.....	.....	
Sandia, Jim Wells	1937	....	....	....	....	22,579	2,900	Catahoula; 3,925 Frio; 4,000 Jackson
Sam Fordyce, North, Hidalgo	....	....	....	....	....	225,690	.....	
Sarnosa, Duval	1932	....	33	33	210	3,049,460	2,390-2,500	Govt. Wells
Saxet, Nueces	1923	48	130	178	5,945	60,523,045	3,150-4,700	Catahoula; 4,800 Marg.; 5,500-9,900 Frio
Scott & Hooper, Brooks	1944	10	....	10	280	256,017	6,536-6,875	Frio
Seeligson, Jim Wells-Kleberg	1938	581	4	585	34,815	35,127,668	4,750-6,725	Frio
Sejita, Duval	1940	38	2	40	1,355	1,543,128	5,450-5,776	Jackson

TEXAS RAILROAD COMMISSION DISTRICT 4—(Continued)

Field and County—	Year of discovery	Oil-producing wells: Flowing	Oil-producing wells: Pumping	Oil-producing wells: Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Seven Sisters, Duval	1935	1	377	378	6,095	26,880,657	2,112-2,500	Govt. Wells
Seven Sisters, S., Duval	1937	....	15	15	45	809,741	1,500-2,600	Jackson
Shield, Nueces	1940	8	1	9	430	795,530	6,600-7,000	Frio
Sinton, W., San Patricio	1944	3	....	3	55	22,926	3,400-3,500	Catahoula
Southland, Duval	1939	22	4	26	1,140	724,734	5,290-5,365	Pettus
Staggs, Webb	1945	....	2	2	25	21,235	2,800	Yegua
St. Charles, Aransas	1941	....	....	....	....	.....	9,306	
Strake, Duval	1943	2	6	8	450	401,149	3,140-3,230	Govt. Wells; 3,711-25 Pettus
Stratton, Nueces-Kleberg	1931	246	2	248	9,925	15,450,210	4,800-7,200	Oligocene
Sullivan City, Hidalgo-Starr	1939	16	2	18	353	1,137,316	3,300-4,570	Frio
Sun, Starr	1938	73	5	78	2,925	5,518,279	3,900-4,858	Frio
Sun N. (Santa Elena), Starr	1942	34	1	35	1,625	1,951,710	4,535-5,800	Frio
Sweden, Duval	1937	1	2	3	40*	315,946	5,100-5,800	Govt. Wells and Cockfield
San Salvador, Hidalgo	1938	....	....	....	....	.....	7,333-8,701	Cole
Sinton, San Patricio	1945	1	....	1	80	2,824	6,668	Frio
Taft, San Patricio	1935	32	43	75	2,240	8,955,056	3,980	Catahoula; 4,900 Het.
Taft, E., San Patricio	1946	2	....	2	115	14,618	5,580-5,604	Frio
Taranchaus, Duval	1939	....	27	27	555	1,232,680	2,050	Frio
Tesoro (De Soto), Duval	1938	1	....	1	10	249,082	4,850	Jackson; 5,175 Pettus
Thomas Lockhart, Duval	1937	6	2	8	90	176,826	3,960	Hockley; 4,671-5,100 Cockfield
Tijerina-Canales, Jim Wells-Kleberg	1944	118	....	118	7,878	3,988,709	7,108-7,221	Frio
Tom Graham (E. Alice), Jim Wells	1938	32	....	32	890	2,953,579	5,307-5,400	
Turkey Creek (West Saxet), Nueces	1938	33	8	41	1,235	6,265,869	3,830	Catahoula; 5,800-6,900 Frio
Volpe, Webb	1939	....	27	27	535	1,139,826	2,465	Mirando
Violet, Nueces	1943	....	....	....	....	.....	7,200	Frio
Wade City, Jim Wells	1939	26	42	68	1,440	6,316,325	3,245-4,938	Frio-Vicksburg
Weil, Jim Hogg	1943	5	....	5	235	273,918	5,060	Pettus
Welder, Duval	1944	....	4	4	40	44,177	2,069-2,100	Jackson
White Point, San Patricio	1913	....	1	1	25	236,269	1,900	Oakville; 4,900-5,900 Frio
White Point, E., San Patricio	1938	202	39	241	11,100	28,483,081	3,950	Catahoula; 5,600-5,800 Frio
Willamar, Willacy	1940	193	7	200	13,845	9,800,990	7,600-7,900	Frio
Willmann, San Patricio	1945	11	....	11	490	325,385	4,558	Vicksburg
Weslaco, South, Hidalgo	....	....	....	....	....	.....	7,455-7,500	Frio
Wilson, Jim Wells	1943	....	....	....	....	.....	7,300	Frio; 7,900 Vicksburg
Yeager, Jim Wells	1943	....	3	3	10	126,134	3,765	Pettus
Yturria, Starr	1941	16	3	19	605	744,050	4,193-4,300	Frio
Yzaguirre, Starr	1940	....	....	....	....	5,362	4,608-5,230	Frio
Zim, Starr	1939	....	....	....	....	.....	.....	
Total		3,681	5,019	8,700	222,501	693,042,099		

*Abandoned.

SOUTH LOUISIANA

Field and Parish—	Year of discovery	Oil-producing wells: Flowing	Oil-producing wells: Pumping	Oil-producing wells: Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Abbeville, Vermilion	1937	9	....	9	215	1,131,172	6,253-6,373	Miocene
Alliance, Plaquemines	1946	2	....	2	....	744	9,074	Miocene
Anse La Butte, St. Martin	1902	59	13	72	6,958	15,385,157	2,960	Mio., 4,850-5,000, 11,025, Olig.
Arnaudville, St. Martin	1942	....	....	....	gas	15,434	10,360	Frio.
Avery Island, Iberia	1942	18	1	19	3,509	3,153,071	8,648-11,880	Miocene
Bancroft, Beauregard	1938	4	12	16	458	3,930,488	7,325	Cockfield
Barataria, Jefferson	1939	27	....	27	4,047	7,911,471	7,632-9,026	Miocene
Bastian Bay, Plaquemines	1941	7	....	7	828	617,777	4,340-9,980	Miocene
Bateman Lake (Berwick), St. Mary	1937	4	....	4	216	1,503,611	8,675-10,905	Miocene
Bay Baptiste (S. Lirette) Terrebonne	1938	1	....	1	cond.	10,043	11,175	Miocene
Bay de Chene, Jefferson & La Fourche	1941	1	....	1	204	319,853	2,460-7,500	Miocene
Bayou Blue, Iberville	1929	26	8	34	1,799	4,575,562	1,246-4,150	Miocene
Bayou Bouillon, St. Martin	1902	....	....	....	gas	569,835	1,090	Miocene, 7,500 Frio.
Bayou Carlin, St. Mary	1945	3	....	3	370	184,702	11,610	Miocene
Bayou Choctaw, Iberville	1931	4	10	14	399	4,435,509	2,358-4,833	Miocene
Bayou Choupique, Calcasieu	1946	....	....	....	....	18,658	8,830	Miocene
Bayou Couba, St. Charles	1942	4	....	4	509	700,201	64,450	Miocene
Bayou De Fleur, Jefferson & Plaquemines	1946	6	....	6	761	227,003	9,365	Miocene
Bayou des Allemands, St. Charles & LaFourche	1937	5	5	10	356	1,579,381	3,755-10,400	Miocene
Bayou des Glaise, Iberville	1944	6	....	6	862	548,460	9,779-10,444	Oligocene
Bayou des Glaise (Old), Iberville	1936	....	....	....	....	4,567	2,600	Miocene
Bayou Mallet, Acadia & St. Landry	1936	13	....	13	970	1,065,147	6,400	Frio; 8,540, Vicksburg
Bayou Mallet, South Acadia	1945	1	....	1	78	29,766	9,610	Chickasahway sd.
Bayou Penchant, Terrebonne	1944	1	....	1	65	46,731	9,929-10,123	Miocene
Bayou Perot (Brady), Jefferson	1945	6	....	6	1,352	444,841	9,270-9,900	Miocene
Bayou Pigeon, Iberia	1940	3	....	3	484	1,120,266	8,100	Miocene
Bayou Sale, St. Mary	1941	61	....	61	9,915	13,100,515	4,541-10,720	Miocene
Bay St. Elaine, Terrebonne	1937	11	4	15	1,561	1,831,683	5,700-10,194	Miocene
Bear, Beauregard	1943	6	....	6	600	787,880	6,510	Frio
Bear Head Creek (Bilbo area), Beauregard	1946	2	....	2	97	16,049	8,415	Cockfield

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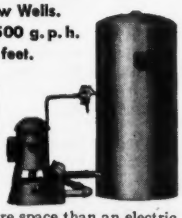

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SOUTH LOUISIANA—(Continued)

Field and Parish—	Year of discovery	Oil-producing wells— Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Belle Isle, St. Mary	1941	4	2	6	40	127,228	5,035-9,870	Miocene
Big Island, 5,000 ft. Belgard), Rapides	*1942	....	....	....	....	3,449	5,150	Wilcox
Big Island, 9,680 ft. (Belgard), Rapides	1946	3	....	3	260	48,844	9,700	Tuscaloosa
Big Lake, Cameron	1935	2	....	2	50	139,670	8,580	Miocene
Black Bayou, Cameron	1929	19	7	26	2,172	13,471,996	3,910	Miocene; 7,450, Frio
Bon Air (Iowa Junction), Jefferson Davis	1945	4	....	4	750	220,304	9,700	Marginulina
Bosco, Acadia & St. Landry	1934	36	8	44	3,093	27,692,385	7,825-7,975	Frio
Branch, Acadia	1942	6	....	6	....	153,483	10,430	Chicasahway sd.; 9,820-11,820
Bully Camp, LaFourche	1942	4	....	4	708	709,332	1.000	Pliocene; 6,395-6,640, Miocene
Caillou Island, Terrebonne	1930	48	8	56	7,037	40,791,406	3,640-11,100	Miocene
Cameron Meadows, Cameron	1931	7	17	24	821	11,103,444	1,350	Pliocene; 4,300-4,440 Miocene
Cankton, St. Landry	*1936	....	....	....	....	47,780	5,316	——, 10,064, Miocene
Chacahoula, LaFourche	1938	26	....	26	1,957	5,389,505	7,240-8,300	Miocene
Chaikley, Cameron	1938	22	2	24	2,012	8,971,352	7,135	Miocene; 8,540, Oligocene
Charenton, St. Mary	1936	26	87	113	4,491	14,426,172	1,121-1,138	Pliocene; 1,846-9,243, Miocene
Cheneyville (Bunkie), Rapides	1935	3	14	17	505	5,996,324	5,418-98	Cockfield; 5,900 Sparta
China (Gas), Jefferson Davis	1940	1	....	1	12	10,320	9,175-9,200	Chickasahway sd.
College Point, St. James	1944	4	....	4	cond.	47,433	10,664-10,778	Oligocene
Creole, Cameron	1938	7	....	7	373	2,680,113	5,120	Miocene
Crowley, Acadia	1945	2	....	2	255	140,429	1,870-9,815	Miocene
Crowley, North	1937	38	2	40	3,975	13,339,612	7,160	Miocene; 8,835 Frio
Crowley, South, Acadia	*1938	....	....	....	....	142,616	4,655-9,220	Miocene
Convent (Hester), 11,000 ft., St. James	1938	....	....	....	....	12,911	5,618-11,098	Miocene
Convent (below 11,000 ft.), St. James	1938	....	....	....	....	84,452	.....	
Darrow, Ascension	1932	3	2	5	573	7,130,579	4,010-9,570	Miocene
Deer Island, Terrebonne	*1942	....	....	....	gas	443	9,565-10,029	Miocene
Delacroix Island, Plaquemines	1941	8	....	8	815	1,064,489	8,980	Miocene
Delarge, Terrebonne	1938	3	....	3	55	849,633	13,230-13,528	Miocene
Delta Duck Club, Plaquemines	1941	12	....	12	925	866,931	3,890-8,179	Miocene 11,370-400
Delta Farms (Bay Brussel), La Fourche & Jefferson	1940	64	....	64	13,932	12,435,821	8,774-10,134	Miocene
Dog Lake, Terrebonne	1929	13	4	17	1,780	4,778,231	6,550-9,008	Miocene
Edgerly, Calcasieu	1912	4	4	8	353	9,214,991	1,500-3,640	Miocene
Egan, Acadia	1943	39	1	40	4,877	2,214,158	9,895-11,906	Lower Miocene
Elton, North, Allen	1939	3	....	3	....	131,269	6,835-7,280	Frio
Elton, South, Jefferson Davis	1937	4	....	4	65	174,769	8,960	Chickasahway sd.
Eola, Avoyelles	1939	22	54	76	4,295	22,600,493	7,455	Sparta; 8,500 Wilcox
Erath, Vermilion	1940	29	2	31	18,715	4,515,362	7,360-11,600	Miocene
Fausse Point, Iberia & St. Martin	1927	12	1	13	1,325	1,511,105	4,983-5,169	Miocene
Fields, Beauregard	1943	4	3	7	386	330,264	8,015	Cockfield
Flatwoods, Rapides	1945	....	....	....	....	490	6,490	Wilcox
Four Isle Bay, Terrebonne	1934	1	....	1	....	291,500	5,518-5,639	Miocene
Fresh Water Bayou, Vermilion	1942	2	....	2	gas	4,861	9,950-11,587	Miocene
Garden Island Bay, Plaquemines	1935	35	6	41	3,449	11,195,942	4,072-7,528	Miocene
Gibson, Terrebonne	1937	28	2	30	2,762	13,343,935	8,594-10,300	
Gibson, East, Terrebonne	1943	....	....	....	....	14,092	.....	
Gibson, Northeast, Terrebonne	1941	15	2	17	3,484	5,488,262	5,878-9,300	Miocene
Gillis-English Bayou, Calcasieu	1934	3	16	19	549	23,292,305	6,396-7,149	Miocene
Golden Meadows, LaFourche	1938	54	90	144	8,806	25,895,092	2,660-10,740	Miocene
Good Hope, St. Charles	1944	27	....	27	5,431	2,861,053	7,840	Miocene
Gordon, Beauregard	1944	3	....	3	....	6,330	5,320-6,715	Oligocene
Grand Bay (Bird Island) Plaquemines	1938	50	....	50	8,363	17,618,610	6,125-10,453	Miocene
Grand Lake, Cameron	1939	20	....	20	1,882	7,682,611	6,715-6,811	Miocene
Gueydan, Vermilion	1932	20	8	28	4,733	9,239,947	3,458-9,947	Miocene
Gueydan, West, Vermilion	1938	18	2	20	1,287	2,223,359	6,685-10,814	Miocene
Gum Cove Prospect, Cameron	1944	2	....	2	30	132,096	9,140-9,650	Miocene
Hackberry, East, Cameron	1927	31	28	59	4,572	35,070,436	2,750	Miocene; 10,740 Oligocene
Hackberry, West, Cameron	1928	50	29	79	6,320	21,044,657	3,100	Miocene; 9,200-9,500 Oligocene
Hahnville Prospect, St. Charles	1946	1	....	1	....	3,420	8,780	Miocene
Happytown, St. Martin	1939	2	....	2	148	782,763	9,750	Frio
Hayes (cond.), Calcasieu	1942	1	....	1	cond.	21,432	11,570-670	Oligocene
Hester (Convent), St. James	1943	(See Convent)			....	.....	.....	
Holmwood, Calcasieu	1947	1	....	1	....	.....	11,360	Miocene
Hope Villa, E. Baton Rouge	1943	1	....	1	40	32,149	9,570	Frio
Horse Shoe Bayou, St. Mary	1937	13	....	13	1,564	3,550,851	10,180-11,320	Miocene
Houma, North, Terrebonne	1945	....	....	....	....	258	10,295	Miocene
Houma, South, Terrebonne	1938	2	....	2	124	790,167	10,300	Miocene
Iberia, Iberia	1917	43	25	68	4,607	36,329,806	850	Plio.; 3,500-5,100 Mio.; 8,900 Olig.
Indian Village (Bayou Serpent), Jefferson Davis	1944	1	....	1	100	85,203	7,140	Lower Miocene
Iota, Acadia	*1945	....	....	....	....	21,771	9,385	Frio
Iowa, Calcasieu & Jefferson Davis	1931	51	17	68	7,350	60,426,434	4,397-5,917	Mio.; 6,538-8,212 Marginulina
Jeanerette, St. Mary	1935	10	4	14	1,000	12,135,650	6,630-11,460	Miocene
Jeanerette, North, St. Mary	1943	4	....	4	287	309,088	11,398-11,940	Miocene
Jeanerette, South, St. Mary	1945	3	....	3	204	113,706	5,046-7,484	Miocene
Jefferson Island, Iberia	1938	4	5	9	330	1,965,237	3,080	Mio.; 7,820-9,517, Oligocene
Jennings (Deep & Shallow), Acadia	1901	26	58	84	5,812	96,814,247	1,500-1,650	Miocene; 6,172-6,522 Frio

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SOUTH LOUISIANA—(Continued)

Field and Parish—	Year of discovery	Oil-producing wells: Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Jennings, South, Jefferson Davis	1936	....	....	....	....	144,911	8,605-8,850	Miocene; 9,510 Heterostegena
Kaplan, Vermilion	1947	1	....	1	50	3,000	11,070	Miocene
Kenilworth (Reggio-Shell Beach), St. Bernard	1939	1	....	1	8	143,236	4,395-4,436	Miocene 10,595-10,635
Krotz Springs, St. Landry	1942	5	....	5	75	153,925	7,780	Miocene; 92,90 Oligocene
Lake Barre, Terrebonne	1929	6	17	23	600	18,637,737	3,465	Miocene 10,460, 11,775
LaFitte, Jefferson	1935	57	6	63	11,609	48,982,888	8,660-10,165	Miocene
LaFourche Crossing, La Fourche	1939	6	....	6	....	995,219	9,620-10,125	Miocene
Lake Arthur, Jefferson Davis	1937	10	2	12	1,168	2,521,928	8,500	Mio.; 9,800 Het.; 9,575 U. Marg. 10,100 L. Marg.
Lake Chicot, St. Martin & Iberia	1941	17	....	17	4,444	3,512,067	7,720-10,345	Miocene
Lake de Cade, Terrebonne	1942	1	....	1	33	78,728	10,200	Miocene
Lake Hermitage, Plaquemines	1934	1	1	2	....	163,684	3,116-9,416	Miocene
Lake Long, LaFourche	1937	15	2	17	1,000	5,099,278	9,368-10,416	Miocene
Lake Mongoulois, St. Martin	1939	3	....	3	700	535,616	9,950-10,062	Marginulina
Lake Pelto, Terrebonne	1929	19	4	23	3,786	6,146,514	5,000-11,008	Miocene
Lake Salvador, St. Charles	1940	26	....	26	4,507	7,443,391	9,570	Miocene
Lakeside (Lowry), Cameron	1941	5	....	5	cond.	110,031	9,980	Lower Miocene
Lake Washington, Plaquemines	1931	7	....	7	427	3,782,500	1,130-1,495	Cap Rock
Lapeyrouse, Terrebonne	1941	1	....	1	cond.	1,104	10,885	Miocene
LaPice, St. James	1939	19	5	24	2,784	2,426,393	6,800-11,000	Miocene
LaPlace, St. John the Baptist	1939	5	....	5	82	444,974	8,120-8,210	Miocene
Laurel Ridge, Iberville	1944	2	....	2	....	4,725	10,700	Miocene
Leeville (Bayou LaFourche), LaFourche	1931	28	46	74	3,952	30,454,442	3,040-11,610	Miocene
Lewisburg, Acadia & St. Landry	1941	3	....	3	76	128,216	9,650	Chickasahway sd.
Lewisburg, South (Church Point), Acadia	1943	3	....	3	50	41,410	10,230	Chickasahway sd.
Lirette, Terrebonne	1937	11	....	11	....	879,396	8,370-12,020	Miocene
Little Chenier, Cameron	1940	....	....	....	....	12,000	10,200	Miocene
Little Temple, LaFourche	1946	....	....	....	....	2,462	10,600	Miocene
Lockport, Calcasieu	1924	11	10	21	920	17,211,620	2,200-7,300	Miocene & Middle Oligocene
Longville, Beauregard	....	1	....	1	228	12,000	.....	
Mamou, Evangeline	1945	8	....	8	1,397	335,942	11,520	Wilcox
Moss Lake, East, Calcasieu	1944	5	....	5	cond.	41,428	10,420	Lower Miocene
Mud Lake, Cameron	1945	1	....	1	cond.	1,384	9,640-10,660	Hackberry
Napoleonville, Assumption	1943	6	1	7	534	383,355	9,000-9,470	Miocene
Neale, Beauregard	1940	40	10	50	3,805	9,755,045	8,356-11,566	Wilcox
Niblett's, Jefferson Davis	*1940	....	....	....	....	5,389	11,615	Marginulina
North Cankton, St. Landry	1944	2	....	2	1,319	1,109,960	2,790	U. Mio.; 9,475-10,060, L. Mio.
North Tepetate, Acadia	1938	....	....	....	....	.....	7,900	Oligocene 8,400, 8,900, 9,000
Oretta, Beauregard	1945	7	....	7	336	159,273	8,710	Cockfield
Oretta, North, Beauregard	1946	1	....	1	13	8,439	8,430	Cockfield
Oberlin, South, Allen	1946	1	....	1	18	8,966	12,660	Wilcox
Paradis, St. Charles	1939	68	....	68	10,053	19,824,194	9,620-11,130	Miocene
Pecan Island, Vermilion	1943	5	....	5	cond.	2,987	7,500-10,852	Miocene
Pecan Lake, Cameron	1941	....	....	....	cond.	10,000	10,180	Lower Miocene
Perkins, Calcasieu	1939	1	....	1	....	29,002	5,365-7,040	Oligocene
Pine Grove, Beauregard	1945	....	....	....	....	1,547	11,345	Wilcox
Pine Prairie-Deep, Evangeline	1941	53	7	60	5,171	8,593,956	7,500-9,000	Sparta; 9,390-10,539 Wilcox
Pine Prairie-Shallow, Evangeline	1912	....	....	....	....	20,000	1,300	Cap rock; 2,340 Miocene
Plumb Bob (Henderson), St. Martin	1939	4	2	6	568	797,346	8,256-8,385	Marginulina
Pointe Au Fer, Terrebonne	1941	....	....	....	....	202	5,625	Miocene
Port Allen, W. Baton Rouge	1941	4	....	4	286	742,176	9,615	Marginulina
Port Barre, St. Landry	1929	28	29	57	3,907	15,721,405	3,100-3,530	Lower Miocene; 3,610 Olig.; 5,120 Cockfield
Potash, Plaquemines	1937	14	6	20	1,066	3,926,356	10,870	Miocene
Quarantine Bay, Plaquemines	1937	45	....	45	8,220	19,286,707	7,695-9,550	Miocene
Queen Bess Isle (E. Barataria Bay), Jefferson	1946	1	....	1	....	250,200	11,400	Miocene
Rabbit Island, Iberia	1942	....	....	....	cond.	331	8,675	Miocene
Raceland, LaFourche	1938	12	1	13	1,640	5,119,432	8,170-9,265	Miocene
Reddell, Evangeline	1943	11	....	11	gas-cond.	124,018	9,600-10,010	Sparta
Reserve, St. John the Baptist	1945	1	....	1	92	127,171	10,260	Frio
Ritchie, Acadia	1940	4	16	20	1,215	1,588,771	3,500	Miocene
Roanoke, Jefferson Davis	1934	17	10	27	2,974	13,198,953	6,220	Miocene; 7,960 Het.; 8,030 Marg.
Rosedale, Iberville	1943	5	....	5	360	403,755	10,220	Lower Miocene
Ritchie, North, Acadia	1943	9	....	9	949	463,732	8,600	Lower Miocene
Roanoke, S., Jefferson Davis	1937	(See Lake Arthur)			....	.....	.....	
St. Gabriel, Iberville	1941	31	....	31	5,099	9,519,744	7,750-8,660	Miocene; 9,677-9,705 Olig.
St. James, St. James	1943	....	....	....	....	153,274	10,770	Miocene
Section 28 Dome (Hager), St. Martin	1940	6	....	6	1,218	681,624	8,905-9,100	Marginulina; 10,960 Olig.
Shuteston, St. Landry	1943	7	....	7	557	368,118	9,500	Lower Miocene
Singer, Beauregard	1946	4	....	4	297	66,800	7,640	Cockfield
Sorrento, Ascension	1928	7	....	7	78	1,364,392	870-1,650	Cap rock; 4,300-4,430 M. Olig.
St. Martinville, St. Martin	1935	12	....	12	455	1,636,501	5,560	Miocene; 9,755 Het.
St. Martinville, N., St. Martin	1945	8	....	8	....	99,119	9,730	Miocene
St. Martinville, S., St. Martin	1945	2	....	2	....	1,510,082	.....	
South Lake Charles, Calcasieu	1944	..	....	..	....	9,938	10,025	Lower Miocene
Starks, Calcasieu	1927	2	20	22	290	4,088,670	525-1,500	Cap rock and sands; 3,025-8,225 Miocene and Oligocene

SOUTH LOUISIANA (Continued)

Field and Parish—	Year of discovery	Oil-producing wells— Flowing	Pumping	Total	Daily average prod. (bbl.)	Cumulative prod. to Mar. 1, 1947 (bbl.)	Depth of sand (ft.)	Producing formation
Stella, Plaquemines	1940	7	....	7	537	1,308,915	6,300-10,000	Miocene
Sulphur Mines, Calcasieu	1926	6	59	65	2,449	19,830,787	2,625-5,187	Olig.; 5,000-6,715 Mid. Olig.
Sweet Lake, Cameron	1926	14	3	17	1,440	8,718,069	3,200-3,325	Miocene; 8,300 Marginulina
Savoy (Savoy), St. Landry	1947	1	....	1	31	31	8,960	Oligocene
Tepetate, Acadia	1935	21	30	51	2,401	14,472,244	8,300	Marg.; 9,165 Chickasahway sd.
Tepetate, North, Acadia	1938	22	....	22	982	924,640	7,800	Frio
Tepetate, W., Jefferson Davis	1944	34	....	34	5,052	3,136,125	8,400-9,276	
Thornwell, South (Cond.), Jefferson Davis	1942	3	....	3	....	35,272	9,640	Miocene
Timbalier Bay, LaFourche	1938	....	2	2	70	338,920	6,960	Miocene
University (Baton Rouge), East Baton Rouge	1938	31	31	62	5,561	21,466,847	6,420-7,165	Miocene; 9,330-9,960 Frio
Unknown Pass, Orleans	1941	....	....	....	....	12,635	9,890	Oligocene
Vacherie, St. James	1938	6	1	7	469	528,818	5,700	Miocene
Valentine, LaFourche	1936	3	10	13	587	6,138,719	3,840-7,500	Miocene
Venice, Plaquemines	1937	45	....	45	9,785	16,900,727	3,450-11,898	Miocene
Vermilion Bay, Iberia	1939	1	....	1	235	679,694	10,090-10,740	Miocene
Ville Platte, Evangeline	1937	158	85	243	8,218	34,955,044	8,900-9,160	Sparta; 9,900-10,400 Wilcox
Vinton & North Flank, Calcasieu	1910	68	45	113	9,956	53,709,922	1,872-3,600	Pliocene-Miocene
Weeks Island, Iberia	1945	4	....	4	1,185	293,624	13,600	Miocene
Welsh, Jefferson Davis	1903	2	7	9	20	743,718	1,000-3,000	Miocene; 6,510 Marg.; 8,850 Chickasahway
West Bay, Plaquemines	1940	26	....	26	4,086	5,797,895	7,270-10,446	Miocene
West Lake Verret, St. Martin	1938	22	14	36	3,326	6,018,564	1,350	Miocene; 11,000 Marg.-Frio
Westwego, Jefferson	1941	3	....	3	128	496,282	5,150-9,000	Miocene
White Castle, Iberville	1929	22	9	31	2,734	11,286,052	5,150-6,730	Miocene; 8,725 Oligocene
White Lake, West, Vermilion	1943	3	....	3	270	154,696	10,700	Miocene
White Lake, East, Vermilion	1940	25	1	26	3,766	4,778,213	5,952-10,024	Miocene
Woodlawn, Jefferson Davis	1938	20	1	21	2,158	7,157,470	7,500	Het.; 8,140 Marg.; 9,525 Hack.
West Bastian Bay, Plaquemines *	1944	....	....	....	....	.....	.....	
West Mermentau, Acadia & Jefferson Davis	1940	2	....	2	....	167,260	9,125	Discorbis; 9,720 Het.; 10,200 Marg.
West Cote Blanche Bay, St. Mary	1940	16	5	21	2,884	4,294,856	2,035-9,265	Miocene
Total		2,640	1,132	3,772	349,010	1,163,693,643		

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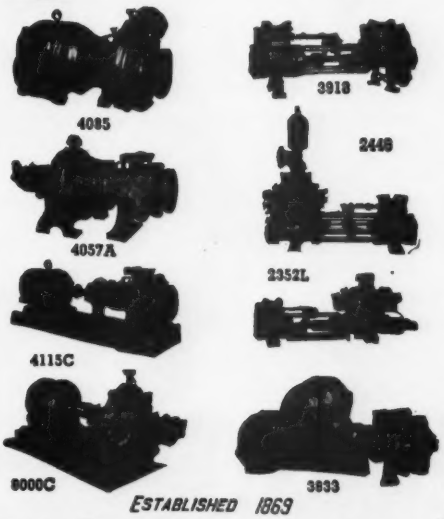

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A Tale of Two Tees

Cooperation Gets Stainless Tree On Corrosive Well At Lirette Field Quickly

AN outstanding example of the type of service needed and obtained from equipment manufacturers is dramatically illustrated in this story of a christmas tree—a special-order, all-stainless-steel tree. An exceptionally severe corrosion problem was encountered by a major oil company on two wells at Lirette field in Louisiana. Corrosion was so severe that immediately replacement of at least one tree was imperative.

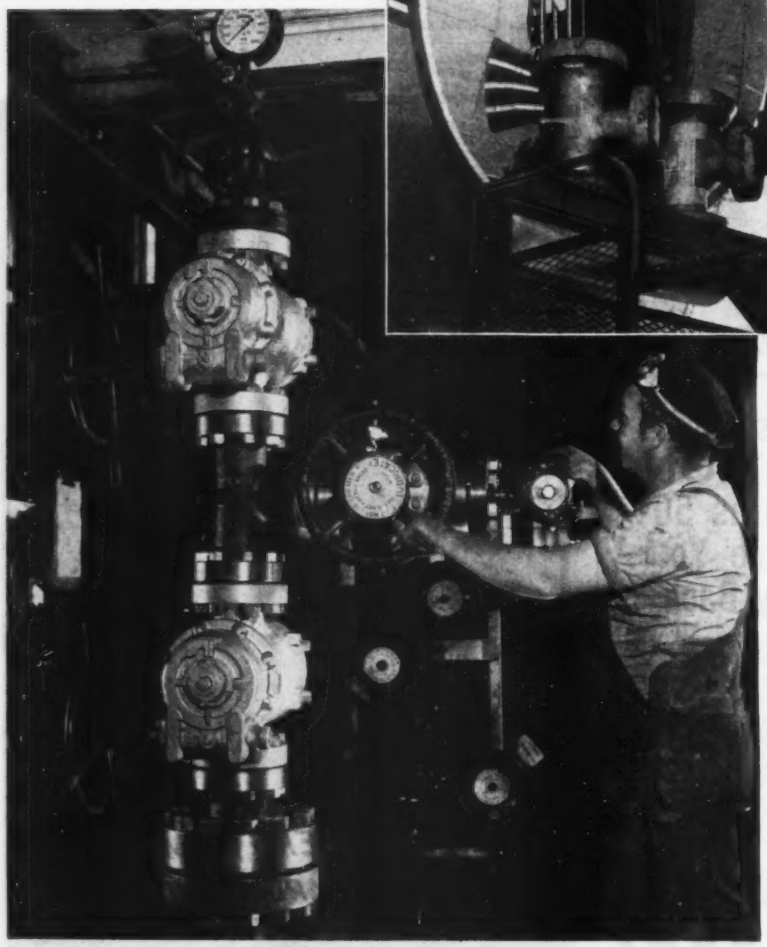
McEvoy Co. of Houston started on the problem on April 24 of making up the stainless trees for delivery by May 20. Since it was not known whether one of the present trees would hold the well until this date, the request was made by the oil company to ship at least one tree as quickly as possible. Since 45 days is the fastest delivery normally quoted on custom trees even the May 20 delivery date was considered fast.

Merco Nordstrom weld-lined valves were specified as master valves. The nearest valves of the type and size required were 2,000 miles away, but an exchange of telegrams got them started on their way. Tees were the most serious problem. There were no tees of the required size and type anywhere. So a special order of stainless tees was cast by Lebanon Steel Foundry of Lebanon, Pa., after the situation was outlined via a series of telegrams and telephone calls. The castings were made immediately and taken to Washington to catch a Houston-bound plane early in the morning of May 2. The plane was met Friday afternoon and machining work on the castings was started within an hour.

Machining of the tees was completed Friday night. The first tree was assembled, tested, and prepared for shipment Saturday. It started by motor freight for its destination at Paradis, La., late Saturday afternoon, May 3—17 days before the promised delivery date, and only 9 days after the order was received.

Stainless steel christmas trees have been receiving considerable attention recently as a result of the appearance of highly corrosive agents in oil-water and gas-distillate wells, principally along the Gulf Coast. The corroding influences include chloride salts and hydrogen sulfide in oil-water liquids, and carbonic acid in gas distillate wells.

Operators have tried many ways to combat this corrosion. The most satisfactory way yet found, as far as the christmas tree is concerned, is to make the item entirely out of stainless steel. However, most types of stainless steel fall short of A.P.I. requirements in strength and hardness. One selection for this purpose found very suitable is an alloy known as Circle L-12. The alloy combines the required strength with a high corrosion resistance. Christmas trees and valves using the alloy have been in service for well over a year. As yet, there are not evidences of corrosion of the stainless steel parts on any of these trees or valves.



These two pictures show what "get it done" means in the oil fields. Above, two special stainless steel tee castings are unloaded in Houston from a plane from the east. At left, 1 day later, the completed special christmas tree is tested in a Houston factory and is ready to go onto an emergency job on a Louisiana well

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Corrosion of Condensers By Sulfide

Our cast-iron condenser sections in our topping plant are being destroyed by hydrogen sulfide after about 9 months of operation. We process a high-sulfur crude oil. What other materials can be used for the condensers?—F. A. C.

Not much is available for resisting sulfide corrosion. Monel metal is excellent and has been used in the tops of towers and throughout the condenser and rundown systems of topping plants but it is expensive and therefore has not been widely used. Ni-Resist cast iron also exhibits about three times the resistance of regular cast iron but it, too, is expensive. Although 5 per cent chromium steel tubes are far more resistant than plain carbon steel tubes, they are probably more expensive than heavy-wall cast-iron pipe or condenser sections. The iron corrodes rapidly but it is cheap and its greater thickness allows a longer useful life than the somewhat thin-wall chromium steel tubing. There are, of course, many expensive high-alloy steels or alloys that cannot be considered for this service. The composition of the above materials is indicated in Table 1.

Effect of Chromium

Apparently irons containing 2 to 6 per cent chromium with minimum nickel to gain reasonable machinability have not been developed. According to experience with steels, the effect of chromium is not noticeable up to about 2 per cent but it becomes rapidly effective up to 5 or 7 per cent. Past 5-7 per cent the excellent resistance may not justify the greater cost.

As partial alleviators to sulfide corrosion, refiners have found that careful settling of brine from the crude oil is helpful and that ammonia in the condenser system may be helpful. These are purely of indirect assistance because they only eliminate the acid corrosion that arises by liberation of hydrochloric acid from the brine. However, it has frequently been noted that a combination of acid and sulfide corrosion is much worse than sulfide corrosion alone.

Solubility of Salt in Steam

In gas-condensate plants, how can liquids be dissolved in gases? Could high-pressure gas be used to dissolve crude oil out of the ground?—F. C. T.

Obviously liquids do dissolve in high-pressure natural gas because many gas-condensate or retrograde-condensation plants are in operation. The general principles of such operations and a typical pressure-temperature phase diagram may be examined in Petroleum Refinery Engineering, second edition, pp. 247-250, McGraw-Hil Publishing Co., Inc., New York, 1941. Undoubtedly small amounts of heavy oils such as those found in crude oil could be dissolved in high-pressure gas but such an operation would probably not be economical.

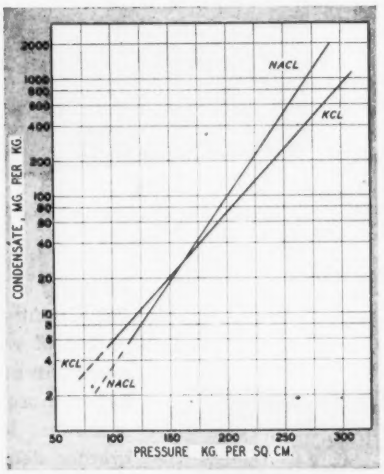


Fig. 1—Approximate solubility of potassium and sodium chloride in superheated steam

About the only information readily available concerning the solubility of high-molecular-weight materials in gases are data on the solubility sodium and potassium chloride in high-pressure steam. Otto Fuchs has studied this situation by the use of an improved autoclave and accessory equipment which permitted measurements of steam composition over aqueous solutions and solid salts at temperatures above 400° C. (725° F.) and pressures up to 300 kg./cm.² (4,240 psia.). His studies were published in Zeitschrift fur Elektrochemie 47,101-10 (1941) under the title, "High-Pressure Steam Solvent." Solubilities as high as 0.124% weight were observed for sodium chloride in superheated steam at 407° C. under a pressure of 275 kg./cm.² Steam containing salt in solution has no significant electrical conductivity and this coupled with earlier observations to the effect that the sodium chloride content of steam is largely independent of the concentration in the liquid phase, indicates that steam acts on sodium chloride by hydrolysis and not by dissociation. The approximate solubilities of sodium and potassium chloride in superheated steam is indicated in Fig. 1.

TABLE 1—ANALYSES OF CONDENSER MATERIALS FOR SULFIDE CORROSION (PER CENT)

	Carbon	Chromium	Nickel	Copper	Iron	Others
"K" Monel	...	...	66.0	29.0	0.9	2.75 Al
Ni-Resist 1	2.8	2.0	15.5	6.5	70.1	1.8 Si
Ni-Resist 2	2.8	2.5	20.0	...	71.6	1.8 Si
4-6 Cr Steel	0.2	5.0	...	...	93.5	0.5 Mo
Cast Iron	3.4			...	94.3	1.8 Si
Cr-Ni-Iron	0.5	1.5	0.5	...	96.4	0.6 Si

Correction—Cost of Coal and Oil

In the issue of April 5, 1947, page 76, the cost of a million B.t.u. of heat was unfortunately stated as $2.18 for No. 6 A.S.T.M. fuel oil and as $2.36 for 14,000 B.t.u. per pound coal which costs $10.50 per ton. The $2.18 refers to the cost of a barrel of the fuel oil and the $2.36 is the cost of an amount of coal equivalent to the heating value of the barrel of the fuel oil.

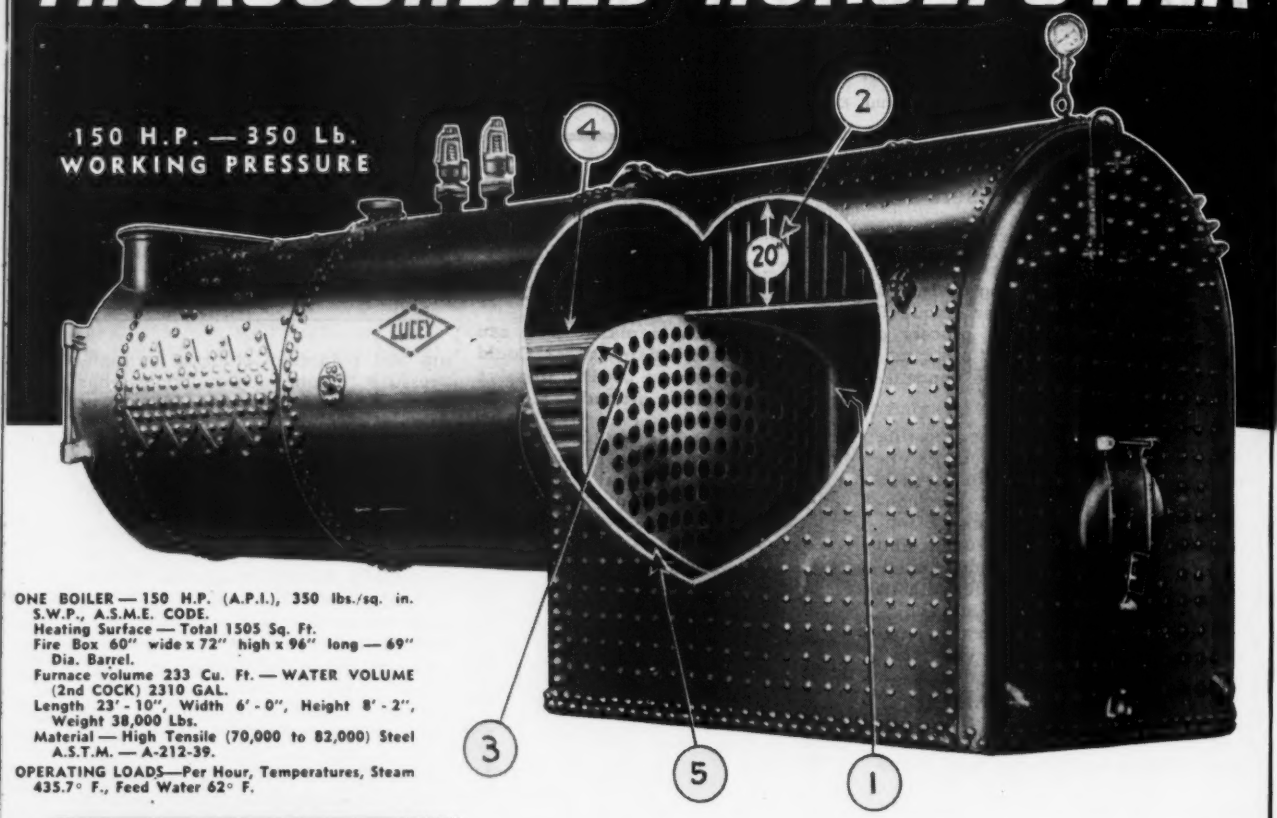
On the basis of 1,000,000 B.t.u., as erroneously stated in Questions on Technology, the costs would be about:

Oil	34.5 cents
Coal	37.5 cents

Obviously, the cost of firing and handling is different for the two fuels and the comparison is not representative because of the exceptionally good coal.

G.N.A. comments with respect to operating costs when firing coal. He finds that these costs range from 50 cents to $2 per ton of coal.

THOROUGHBRED HORSEPOWER



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Heating Surface — Total 1505 Sq. Ft.
Fire Box 60" wide x 72" high x 96" long — 69" Dia. Barrel.
Furnace volume 233 Cu. Ft. — WATER VOLUME (2nd COCK) 2310 GAL.
Length 23' - 10", Width 6' - 0", Height 8' - 2", Weight 38,000 Lbs.
Material — High Tensile (70,000 to 82,000) Steel A.S.T.M. — A-212-39.
OPERATING LOADS—Per Hour, Temperatures, Steam 435.7° F., Feed Water 62° F.

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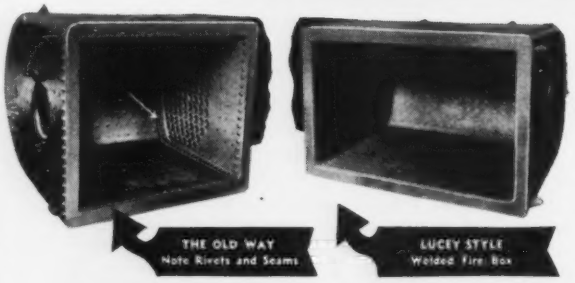

3 ARCHED FIRE BOX CROWN. LARGE CORNER RADII. Good staybolt threads, stronger construction, easy cleaning, better combustion.

4 SHORT TUBES (SEAMLESS) IN VERTICAL ROWS. Effective heating surface.

5 4" WATER SPACE ALL AROUND FIRE BOX. Good water circulation

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MODERN Rotary DRILLING

Hydraulic Transmission

HYDRAULIC transmission of power offers unusual advantages in comparison with mechanical transmission. Considering the common characteristics of the two hydrokinetic drives now commercially used, these advantages include smooth starting, absorption of shocks and vibration, and protection against stalling of the prime mover by an overload. Each of these two drives has in addition certain important characteristics of its own, which contribute to the flexibility of the transmission of power.

Transmission of this type, interposed between the internal-combustion engine and the draw works of a rotary rig, would tend to give to the power rig the flexibility of a steam rig. It is easily understandable, therefore, that much effort has been exerted toward development of this application of the hydraulic transmission. While considerable progress has been made in this direction and while a large number of successful installations have been in operation for a number of years, the problem has to be still considered as being in a relatively early stage of development. As constituted now the hydraulic transmission is used on a rotary rig in conjunction with mechanical transmission, and represents therefore an additional equipment which must be provided for the rig. Question of size of the elements involved and different problems of design remain to be solved in application of this transmission to the large rigs.

Further improvements and wider application of hydraulic drives in rotary-rig service reasonably may be expected. Because of this fact it is advisable to give a brief outline of the fundamental principles governing operation of hydraulic transmissions. Particularly important is bringing out the difference between the two types of hydrokinetic drives used with the rotary rig, the hydraulic coupling and the hydraulic torque converter. Different characteristics of these two types of drives make each one of them applicable to certain specific functions of the rotary rig.

The coupling consists of two elements. The first element, the impeller, is attached to the driving shaft; the second element, the runner, is attached to the driven shaft. Both elements are annular rings, divided into compartments by radial vanes. There is no direct connection between the driving and the driven shaft. (Fig. 24.)

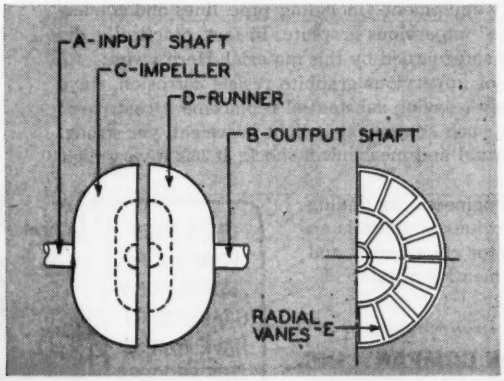

Fig. 24—Schematic diagram of the basic design of a hydraulic coupling

The impeller, driven by the prime mover, imparts kinetic energy to the fluid with which the coupling is filled. This energy is released as the fluid loses its rotational velocity in the blades of the runner. Thus the energy becomes available at the output shaft.

Characteristics.—There are certain losses within the coupling and the speed of the output shaft is always lower than the speed of the input shaft. The difference expressed in percentage of the speed of the driving member, is called the slip. The hydraulic coupling transfers the horsepower in proportion to the cube of the speed of the driving member and the fifth power of the diameter. The torque capacity of the coupling is in proportion to the square of the speed of the driven member and fifth power of the diameter. There is no loss of or gain in torque in the coupling. The torque of the output shaft equals the torque of the input shaft under all conditions of speed and slip.

With hydraulic coupling in the system, the engine starts against no load. As the engine accelerates, the torque of the coupling is built up and the driven shaft is set in motion. The engine cannot be stalled. As the load on the driven shaft increases the engine slows down. However, the slip of the coupling increases faster than the speed of the engine decreases. The slip of 100 per cent can be reached within satisfactory speed range of the engine. With the output shaft stalled, the engine continues to run at a reduced speed. The torque output of the engine equals then the torque of the stalled coupling. As the overload is removed the output shaft speeds up automatically.

Types.—The hydraulic couplings now used belong to two general classes. The simplest is the traction-type coupling. The fluid remains in this coupling at all times. No provision is made for cooling, therefore for continuous operation the coupling can be run only at a very small per cent of slip. In the so-called scoop-type coupling, the amount of the fluid in the coupling may be varied. Provisions are made for cooling the fluid when the coupling is run at a high slip over extended periods of time.

Characteristics of the hydraulic coupling make it particularly suitable to application in mud pump drives. This subject will be considered in discussion of the circulating system of the rig.

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1. R. M. Schaeffer, "Hydraulic Couplings and Torque Converters — Their Principles and Design"—Petroleum Engineer, November 1939.
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3. M. T. Archer, "Hydraulic Couplings in Field Applications"—World Petroleum, July 1940.
4. N. D'Arcy, Jr., "Hydraulic Torque Converters and Couplings"—Petroleum Engineer, November 1945.
5. N. D'Arcy, Jr., "Hydraulic Drives in the Oil Fields"—A paper presented before the Los Angeles meeting of the petroleum division of A.I.M.E., October 24, 1946.

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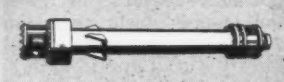

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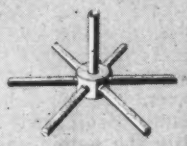

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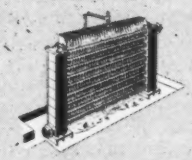

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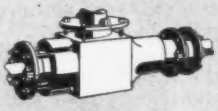

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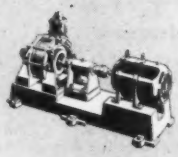

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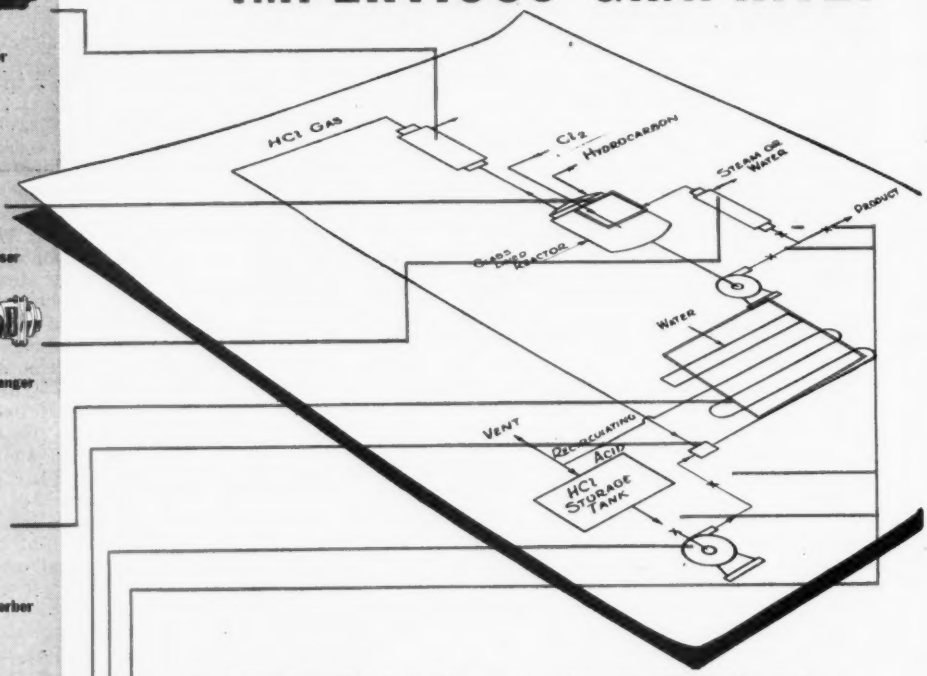

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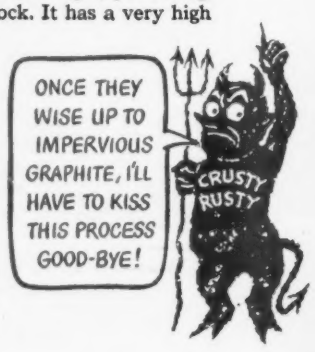

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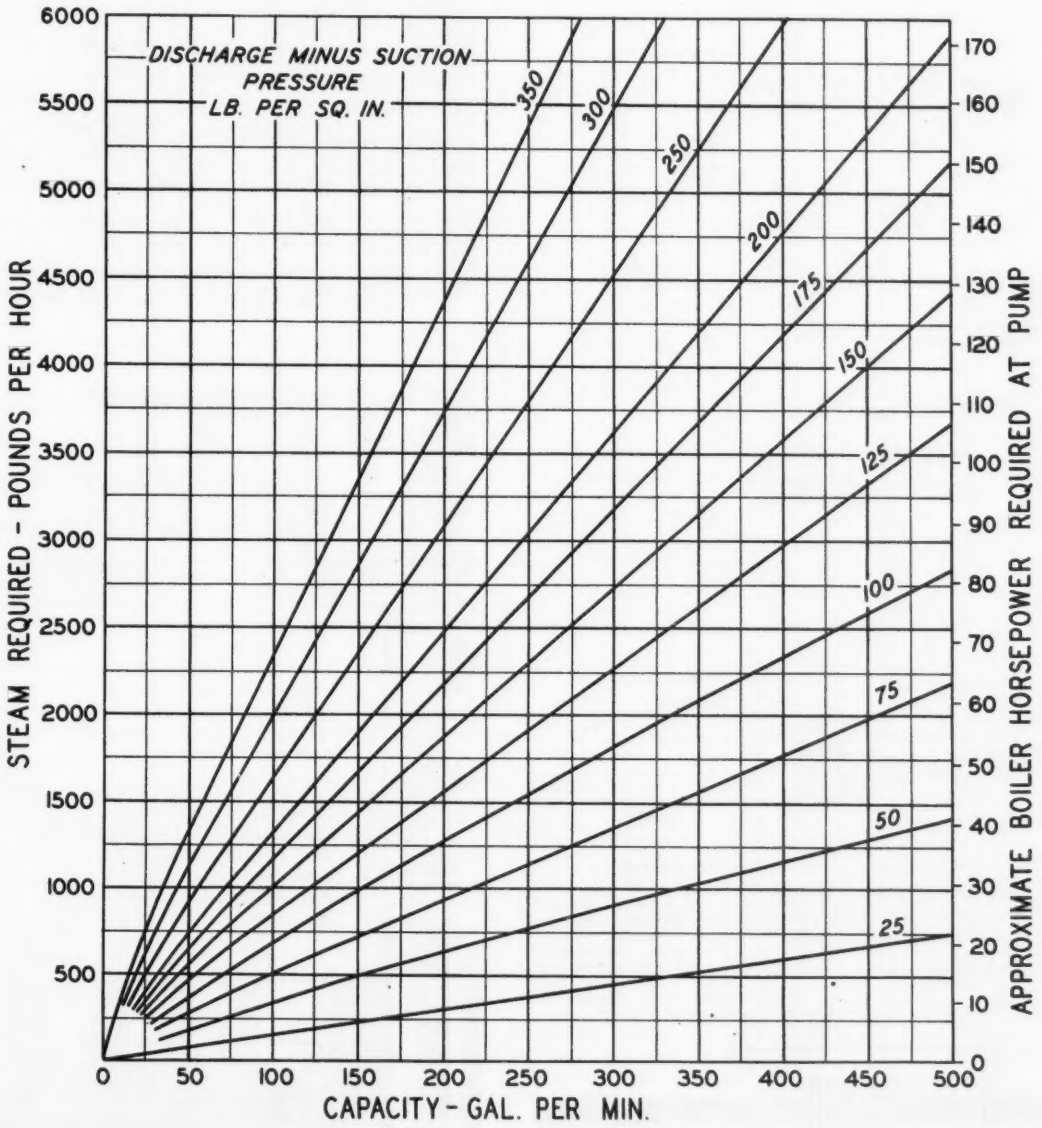
Kind of pump—	Factor	Steam pressure—	Factor	Kind of steam—	Factor
Regular duplex	1.0	100 psig.-saturated	0.99	40° F. superheat	0.96
Regular simplex	0.9	125 psig.-saturated	1.00	100° F. superheat	0.90
Outside packed plunger	1.02	200 psig.-saturated	1.02	99 per cent quality	1.04
In poor repair	1.05	300 psig.-saturated	1.04	98 per cent quality	1.10



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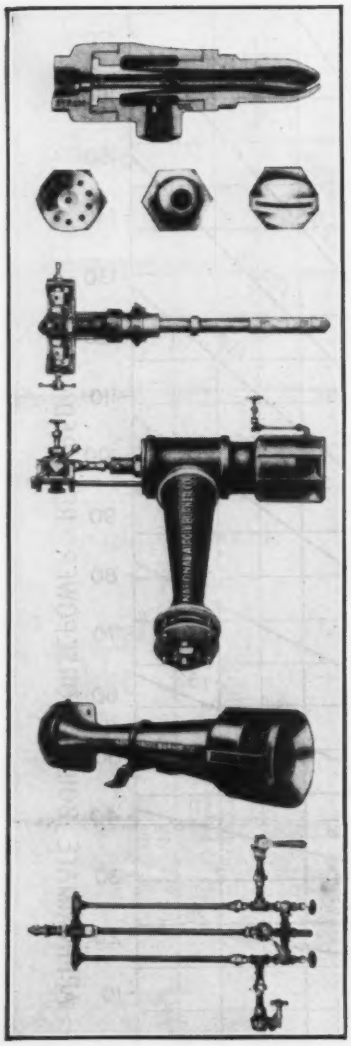

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REFINING

Motor-Fuel Technology Features A.P.I. Program

IMPROVEMENTS in fuel technology and new techniques in the field of refining will be described in papers prepared and presented by some 30 scientists and technologists at the twelfth midyear meeting of the Division of Refining of the American Petroleum Institute which will open June 2 in the Jefferson Hotel in St. Louis.

A record attendance for the 2-day meeting is anticipated, according to Dr. Robert E. Wilson, chairman of the board, Standard Oil Co. (Ind.) and A.P.I. vice president for refining.

Activities in the refining research field will occupy the Monday morning session. Refining equipment and its maintenance will feature the Monday afternoon session. Fuels for jet engines and gas turbines will share the Tuesday morning program with discussions on refining planning and gasoline quality, while reports on gasoline quality under varying conditions will be given Tuesday afternoon.

Speakers for the open dinner meeting Monday evening are Dr. Arthur Holly Compton, chancellor of Washington University, St. Louis, and Ralph C. Champlin, Ethyl Corp., who will report on the public-relations program. Committee meetings, consisting of those on refinery wastes, training in refining, unfired pressure vessels, temperature measurement, automotive research, corrosion, refinery equipment, and the technical advisory group, were scheduled to be heard at various times from Friday, May 30, through June 3.

The preliminary program for the meeting follows:

Monday, June 2

Research and activities, 9:30 a.m.—E. B. McConnell, Standard Oil Co. (Ohio), Cleveland, presiding. "The Synthesis and Properties of Hydrocarbons of High Molecular Weight—IV," a report presented by R. W. Schiessler, Pennsylvania State College, State College, Pa.; "The Components of Gasoline," Cecil E. Boord, Ohio State University, Columbus; "Engine Knock and Molecular Structure of Hydrocarbons," Wheeler G. Lovell, General Motors Corp., Detroit; report on activities of committees—technical advisory, petroleum products, automotive research, disposal of refinery wastes, analytical research, and evaluation of foreign technology.

Equipment and activities, 2 p.m.—Arthur E. Pew, Jr., Sun Oil Co., Philadelphia, presiding "Maintenance of Tubular Heat Exchangers," J. G. Housman, Standard Oil Co. (Ind.), Whiting; "The Importance of Flexible Pipe Supports," E. W. Stothart, Grinnell Co., Inc., Providence, R. I.; report of divisional committees—training in refining, refinery equipment, and subcommittee reports.

Open dinner meeting, 7 p.m.—Dr. Robert E. Wilson, Standard Oil Co. (Ltd.), presiding Speakers, Dr. Arthur Holly Compton, chancellor of Washington University, St. Louis, and Ralph C. Champlin, Ethyl Corp., New York, vice chairman, public-relations operating committee, speaking on the A.P.I. public-relations program.

Tuesday, June 3

Gasoline and related products, 10 a.m.—J. Howard Marshall, Ashland Oil & Refining Co., Ashland, Ky., presiding. "A Refiner's Look at Gasoline Quality," A. P. Frame, Petroleum Advisers, Inc., New York; "Refinery Planning," Davis Read, Universal Oil Products Co., Chicago; and "Fuels for Jet and Gas-Turbine Engines," A J. Nerad, General Electric Co., Schenectady, N. Y.

Gasoline and related products, 2 p.m.—C. E. Davis, Shell Oil Co., Inc., New York, presiding. "The Nowata Road Tests and Their Economic Significance," report by the N.G.A.A. technical committee, pre-

J. BENNETT HILL

A. P. FRAME

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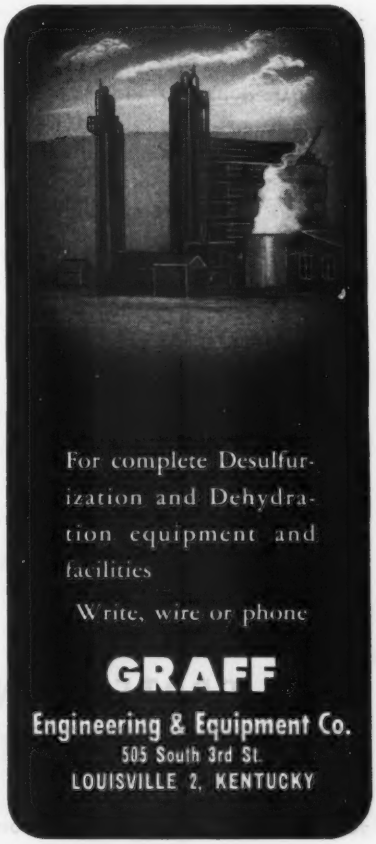
CECIL E. BOORD

Speakers and officials for the twelfth midyear meeting of the A.P.I. Division of Refining next week in St. Louis include: J. Bennett Hill, Sun Oil Co., Philadelphia, chairman of the program committee; A. P. Frame, Petroleum Advisers, Inc., New York, who will speak on "A Refiner's Look at Gasoline Quality"; K. C. Bottenberg, Phillips Petroleum Co., Bartlesville, Okla., who will report on the Natural Gasoline Association of America's recent Nowata road tests on permissible additional fuel volatility; and Cecil E. Boord, Ohio State University, who will give a paper, "The Components of Gasoline"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sented by K. C. Bottenberg, Phillips Petroleum Co., Bartlesville, Okla.; "Some Characteristics of Combustion in the A.S.T.M.-C.F.R. Knock-Test Engine," E. M. Barber, L. E. Endsley, Jr., and T. H. Randall, The Texas Co., New York; and "Correlation of Accelerated and Laboratory Storage Measurements of Gasoline Stability with Field Stability," E. L. Walters, Shell Development Co., Emerysville, Calif.

Pure Buys Alkylation Plant at Smith's Bluff

The government-owned alkylation plant near Nederland, Tex., has been sold to Pure Oil Co., the wartime operator, for $630,200, War Assets Administration announced in Houston.

The plant, built at a total cost of $3,415,000, has been shut down. Capacity is listed at 1,330 bbl. daily with H_2SO_4 alkylation. Pure's nearby Smith's Bluff refinery, now closed by a strike, has a capacity of 55,000 bbl. daily crude and 98,000 bbl. daily cracking. The company began negotiations for the plant some time ago, submitting a purchase offer in January. This was declined, and WAA made a counter-proposal. Further negotiations led to the sale.

Lakes Charles Cracking Unit Sets Performance Record

A new world's record for onstream performance has been established at the Cities Service refinery at Lake Charles, La., where the C catalytic-cracking unit completed a 428-day run on May 4, company officials have announced. This record is already being challenged by the refinery's A unit which on the same day had been onstream for 334 days, and the B unit which was ahead of that with a total of 355 days.

Long runs were described as becoming common at the Lake Charles plant. Previous to these latest runs, the A unit had runs of 330 days and 372 days; the B unit of 334 and 294 days, and the C unit of 237 days. A wartime project, the plant came into operation in April 1944, the first unit completing its 300th day of nonstop operation on February 5, 1945. Designed to process 70,000 bbl. of crude oil daily, the Lake Charles refinery has proved capable of running in excess of 100,000 bbl. daily.

Commercial Solvents Plant Announcement Premature

NEW YORK.—Commercial Solvents Corp. of New York has no plans at present for the construction of a large-scale plant to process natural gas and petroleum products in a variety of commercial products, according to a company spokesman who explained that the recent announcement made in Houston by Dr. Henry Hass was premature.

Hass, head of the chemistry department of Purdue University, is credited with the invention of a nitration process which Commercial Solvents may incorporate on a large-scale basis at some future date.

New Celanese Production

Celanese Chemical Corp. is now producing methyl ethyl ketone, widely used as a solvent in the plastic and lacquer industries, in tank-car quantities, the company announced this week.

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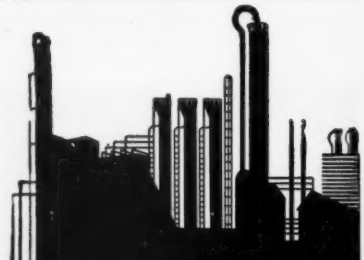

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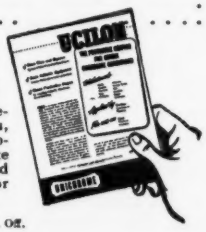

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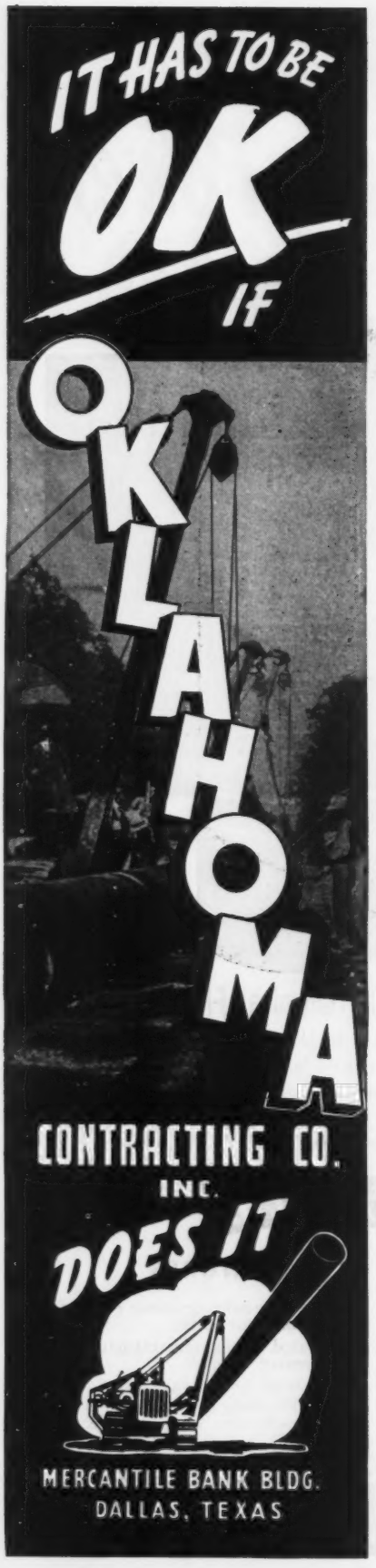

PIPE LINES

Work on New Magnolia Line to Start in June

DALLAS. — Construction on Magnolia Pipe Line Co.'s 20-in. crude-oil line from Corsicana, Tex., to Patoka, Ill., will begin the first week in June, according to an announcement by J. L. Latimer, president.

The 647-mile line has been broken down into six sections and contracts have been awarded on these sections. Oklahoma Contracting Co., Dallas, will build Sections 1, 4, 5, and 6, with respective mileage of 109, 73, 119, and 127. Eastern Construction Co., Dallas, has contract for Section 2, of 108 miles; and H. C. Price Construction Co., Bartlesville, Okla., will build Section 3, involving 111 miles of pipe line.

This new line will connect Magnolia Pipe Line Co.'s system in Texas with its system in Illinois, Indiana, and Ohio, which extends from East St. Louis to Lima, Ohio. The latter system serves Socony-Vacuum Oil Co., Inc.'s Lubrite Division refinery at East St. Louis, and by connecting pipe lines of other companies, serves Socony-Vacuum's Wadhams refinery at East Chicago, its White Star Division refinery at Trenton, Mich., and Socony-Vacuum's plant at Buffalo, N. Y.

Construction will begin soon on three pump stations along the line. All will be equipped with three electrically driven centrifugal pumps, so designed that any two of the units may be operated simultaneously. These will be located at Foreman and Conway, Ark.; and Doniphan, Mo. Also, it will be necessary to enlarge the station at Corsicana where similar units will supplement the equipment there at the present time. At Patoka, three six-cylinder diesel engines, with speed-increasing gears and centrifugal pumps will be added. A pressure of 700 psi. will be maintained on the line.

Construction of the line is under the supervision of L. H. True, vice president and manager, and J. E. McGeath, general superintendent of construction. During the construction period McGeath will make his headquarters in Texarkana, Tex.

Storage facilities at Patoka will be enlarged by the building of two 120,000-bbl. floating-roof-type tanks; five 80,000-bbl. cone-roof-type tanks, and four 80,000-bbl. floating-roof tanks. At Corsicana, four 120,000-bbl. floating-roof tanks will be constructed. There will be no tanks built along the line.

Route of the new pipe line will take it through the following counties in Texas: Navarro, Henderson, Kaufman, Van Zandt, Rains, Wood, Hopkins, Franklin, Titus, Red River, and Bowie. Continuing in Arkansas, it passes through Little River, Sevier, Howard, Pike, Montgomery, Saline, Perry, Pulaski, Faulkner, White, Cleburne, Independence, Lawrence, and Randolph counties. In Missouri it passes through Ripley, Carter, Wayne, Madison, and Perry counties, and continues into Illinois through Randolph, Perry, Washington, and Marion counties.

A daily volume of 100,000 bbl. of crude oil will be pumped northward through the line, starting from Corsicana. It is expected that delivery of the oil will begin around the first of 1948.

During recent years the Socony-Vacuum refineries at East St. Louis, East Chicago, Trenton, and Buffalo increased their crude-oil capacities by more than 26,000 bbl. daily.

Smith Given Contract For Iowa Gas Line

J. R. Smith Construction Co., Eldorado, Kans., has been awarded a contract to build approximately 69 miles of 26-in. gas pipe line from Creston to Knoxville, Iowa, for Natural Gas Pipeline Co. of America.

The work involves river crossings over the Grand, East Clanton, and White Breast rivers. The project will be under the direction of Joe Work with headquarters at Creston. Equipment is now being moved to commence the river-crossing work, but pipe for the line itself is not expected to be received until July 1. Completion is planned in about 3 months.

The project is a part of a Natural Gas Pipeline looping program. In January, the company was given authorization by the Federal Power Commission to construct a 5,000-hp. compressor station near Hooker, Okla.; 39 compressor units of 1,250-hp. capacity each in existing stations, and approximately 110 miles of 24 and 26-in. main-line loops.

The Smith Construction company is now completing 96 miles of 20-in. crude line for Stanolind Pipe Line

Co. from Havana Junction, Okla., to Centerville, Kans., as a part of Stanolind's looping program for its Drumright Okla.-Whiting, Ind., line. One gang has finished work, and a second is to be completed this week.

Stanolind to Construct Caprock-Slaughter Line

Stanolind Pipe Line Co. has awarded a contract to Smith Contracting Co., Fort Worth, for 73 miles of 8-in. crude line from Caprock field, New Mexico, to Slaughter field in West Texas.

The line is planned to move approximately 15,000 bbl. of Caprock crude daily to Slaughter where it will enter Stanolind's main 16-in. trunk line extending north to Drumright, Okla., and Whiting, Ind.

The contracting company is moving in materials and preparing to start construction immediately. The new line will serve unconnected wells on the west side of Slaughter field and two producers in Landon field, in south-central Cochran County. Caprock field has 80 completed producers with an allowable of 2,800 bbl. per day, but is currently running only 1,100 bbl. due to a lack of outlet.

No estimate on the cost of the line has been announced. Completion is expected some time in August.

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Section of Mexican Gas Line Being Laid

Construction is now under way on a 16-mile section of pipe line running from South Welasco field near Weslaco, Tex., to the Rio Grande River. The section will connect with a Mexican-built line to carry natural gas to Monterrey, Mexico.

The line being laid is of 12¾ in. o.d. It is being laid by Reynosa Pipe Line Co., subsidiary of La Gloria Corp., Corpus Christi. Mexican section of the line will be constructed by Gas Industrial de Monterrey, S.A. Total length of the line will be about 150 miles.

La Gloria has four deep gas and gas-distillate wells in South Weslaco field, in addition to its gas supplies in Mercedes field. No date has been set for completion of the 16-mile project.

T.G.&T Lets Contract For 60-Mile Loop Line

J. R. Horrigan Construction Co., Houston, has been awarded a contract by Tennessee Gas & Transmission Co. for 60 miles of 26-in. loop near Monroe, La.

The project is a part of T. G. & T.'s main-line looping program eventually involving 400 miles of 26-in. loops and new compressor stations at Victoria, Tex., Cleveland, Tex., and Natchitoches, La. Also planned is the construction of 99 miles of 16-in. from the present terminal at Agua Dulce, Tex., to San Salvador field in the Rio Grande Valley. The entire program will cost approximately $31,000,000 and will be carried out as the availability of pipe and materials permit.

Pipe-Line Movement Shows Drop in February

Movement of motor fuel by pipe line in February showed a decline from the level in January, although the total for the first 2 months of 1947 continued substantially above that for the corresponding period of 1946.

Motor fuel turned into pipe lines in February totaled 15,228,000 bbl., a drop of 2,135,000 bbl. Motor fuel delivered from pipe lines during the month was 14,674,000 bbl., a drop of 1,633,000 bbl., according to the monthly report of the U. S. Bureau of Mines.

Stocks in lines, working tanks at the end of the month totaled 10,711,000 bbl.—562,000 bbl. more than at the end of January.

Despite the February decrease in volume turned into and delivered from lines, the total for the January-February period was 32,591,000 bbl. turned into lines, and 30,981,000 bbl.

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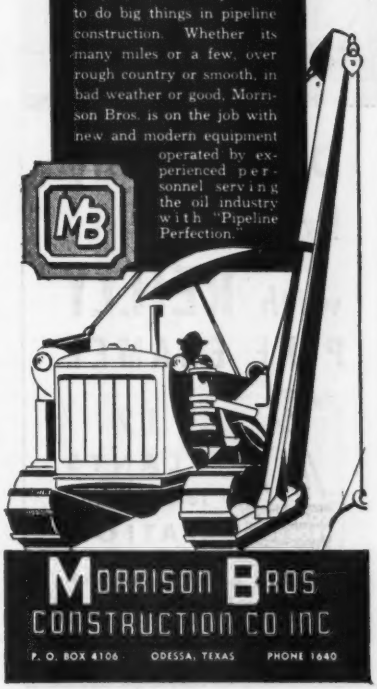

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delivered from lines. For January and February 1946, the totals were 28,149,000 bbl. and 28,659,000 bbl., respectively.

Northern Natural Gas Hearings Set June 16

A hearing on Northern Natural Gas Co.'s request for authorization to increase its natural-gas transmission-system capacity to 580,000,000 cu. ft. daily and the reopening of two hearings on other requests of the company have been set by the Federal Power Commission for June 16.

To increase the system's capacity, Northern Natural proposes construction of a 10,000-hp. compressor station near Garden City, Kans.; 320 miles of 26-in. line from the new station to Palmyra, Neb.; 245 miles of 24-in. line to complete the existing partial line looping from Palmyra to Farmington, Minn.; 17.3 miles of 20-in. line from Palmyra to a point in Saunders County, Neb.; installation of an aggregate of 8,200 hp. in existing compressor stations along the line; and a dehydration plant. Cost has been estimated at $24,500,000.

One of the rehearings scheduled is on an application to build facilities and make deliveries of gas from Northern Natural's Boone-Ames (Ia.) line to Iowa Electric Light & Power Co. for fuel requirements at its electric generating plant at Boone. The other proceeding involves proposed construction to extend the company's Boone-Ames line to Marshalltown, Ia., with intervening connections to the towns of Colo and State Center, Ia.

California Co. Applies for Right-of-Way in Utah

The California Co., largest operator in Rangely field, has filed applications for certain pipe-line rights-of-way across federal lands in Utah.

It is reported that the company is considering routes for possible crude-oil pipe lines. One of these would be from Rangely to Salt Lake City, and the other from Rangely to California. Previously Utah Oil Refining Co. announced plans for building a Rangely-Salt Lake City line; this indicates that two projects are being studied for the Rangely-Salt Lake City movement.

Horrigan Given Contract

J. R. Horrigan Construction Co., has been given a contract for 69 miles of 26-in. loop line in Nebraska for Natural Gas Pipe Line Co. of America. The project is a part of Natural Gas Pipeline's general looping program recently authorized by the Federal Power Commission.

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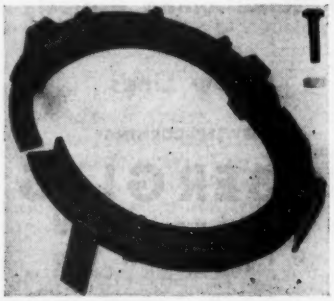

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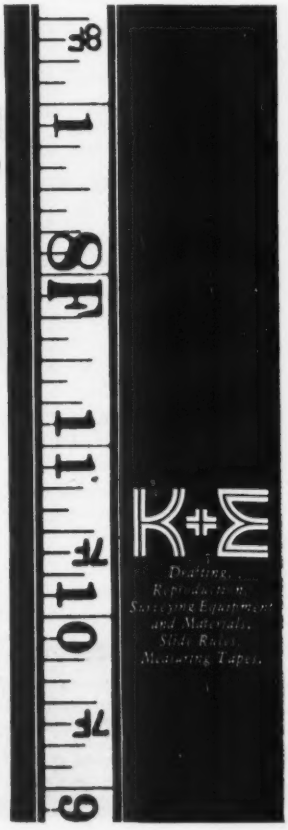

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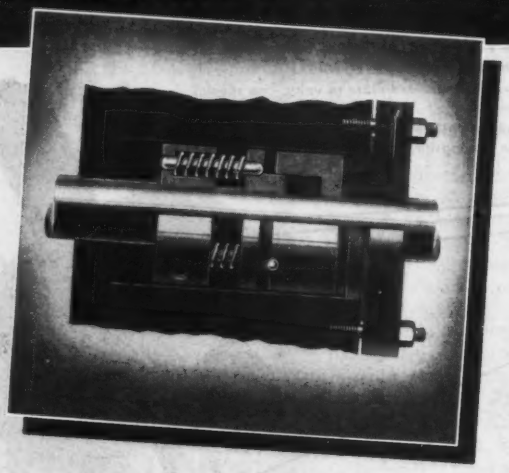

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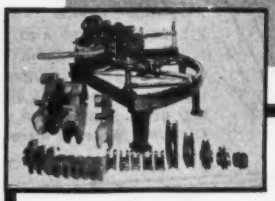

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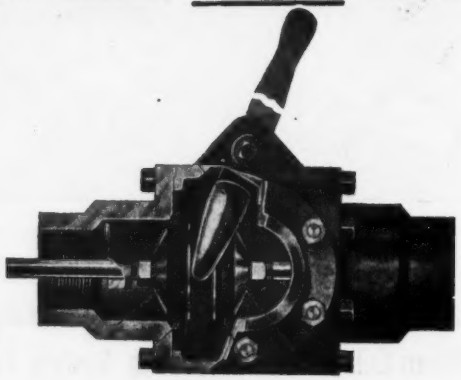

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NATURAL GAS

Gas Industry Pushing $1,000,000,000 Program

THOUGH hampered by shortages of materials, principally steel, pipe, and tin plate, the nation's gas-utility companies are prepared to spend approximately $1,000,000,000 in expanding production, transmission, and distribution capacity to meet continually rising demand.

A survey of the current expansion projects of the gas-utility industry by the American Gas Association, said the companies are employing every resource to satisfy consumer requirements but that materials shortages, in addition to overburdening of the nation's transportation system and delays in obtaining necessary certifications in the natural-gas field, are "seriously obstructing these expansion plans."

"Production capacity of the industry is being increased," the report said. "Standby facilities for storing liquefied petroleum gases for mixing with other gases to meet peak loads are being installed. New discoveries of natural gas are far exceeding consumption. There is no shortage of gas. The shortages exist in materials required to transmit and distribute gas to prospective customers."

"Natural-gas pipe-line facilities are expanding as rapidly as available materials and regulatory situations permit," the A.G.A. report continued. Addition of the $143,000,000 Big and Little Inch lines to the nation's network augments natural-gas supplies in the eastern area. Tennessee Gas & Transmission Co. is planning a 1,000-mile, $55,000,000 gas line from the Houston area to West Virginia. El Paso Natural Gas Co., Southern California Gas Co. and Southern Counties Gas Co. are constructing a $70,000,000, 1,280-mile 30-in. line from Texas to California.

Michigan Consolidated Gas Co. and its subsidiaries will spend more than $1,500,000 this year in gas field facilities, preparatory to construction of the $52,000,000 Michigan - Wisconsin pipe line. Houston Natural Gas Corp. is carrying on an accelerated expansion program, and the gas company affiliates of Amarillo Oil Co. are adding compression facilities and building additional loop lines, including a new 16-in. pipe line. Penn-York Natural Gas Corp. and Dominion Natural Gas Co., Ltd., plan to lay 122 miles of 10-in. high-pressure main to bring gas from the Appalachian areas. These are a few of the hundred of expansion plans of the gas industry, the A.G.A. report said.

"Reports indicate some improvement in the steel situation," it added. "Sheet and strip production facilities were increased from 16,000,000 tons to 19,000,000 tons annually during the war, but labor troubles and stoppages reduced production to about 14,000,000 tons in 1946. Maximum production is hoped for this year, but many industries are clamoring for this production.

A.G.A. Plans Chemical Production Conference

Several papers of interest to the petroleum and natural-gas industries are included on the program of the American Gas Association's joint production and chemical committee conference scheduled for June 2-4 in the Hotel New Yorker, New York.

Among these are: "Catalytic Reforming of Hydrocarbons," by a representative of the Institute of Gas Technology, Chicago; "Storage of Natural Gas in Propane at Low Temperatures," Irving Resnick, Stacey-Dresser Engineering Co., Cleveland; and "Experiences in Handling and Unloading of L.P. Products," A. H. Lauderbaugh, Manufacturers Light & Heat Co., Pittsburgh. The major part of the program deals with subjects primarily of importance to the manufactured gas industry.

Cities Service Cites Pipe Shortage in New Proposal

WASHINGTON. — Inability to secure necessary pipe to construct a main supply line to Hugoton field was cited by Cities Service Gas Co. as the primary reason for its application to the Federal Power Commission for authority to construct alternate facilities to meet peak day demands during the winters of 1947-48 and 1948-49.

The company had planned to construct the Hugoton line and have it in operation by the coming winter. In its new application, Cities Service says: "It is now evident that because of the shortage of pipe it will be impossible for applicant to complete its proposed Hugoton line . . . so that it will be in service this coming winter. Furthermore, there is no assurance that said project can be completed prior to the winter of 1948-49."

As an emergency step, the company proposes to build up the supply on the southern part of its existing system to the extent that the anticipated system capacity of 648,000,000 cu. ft. per day can be maintained during the next two winters. Facilities proposed by the company to enable it to take new supplies into its system include 48 miles of 12-in. extending from near Guthrie on its Oklahoma City line to the Drumright compressor station in Creek County, Oklahoma, extension of a portion of its southern system with 10.5 miles of 16-in. into Grady County and an additional 15.6 miles of 16-in. to increase system capacity on the outlet side of the Tallant compressor station. Total construction cost has been estimated at $1,490,683.

Mississippi Supreme Court Upholds Gwinville Ruling

JACKSON, Miss.—The Mississippi Supreme Court has ruled in favor of the Mississippi Oil and Gas Board in a case in which Superior Oil Co. had appealed from a ruling of the board that provided for 320-acre spacing for gas wells in Gwinville gas field of Jeff Davis County.

The high court's ruling, which was on a technicality in the proceedings and not on the question of what spacing requirements were best suited to the field, ended a long three-way controversy on the matter between operators, landowners, and the board.

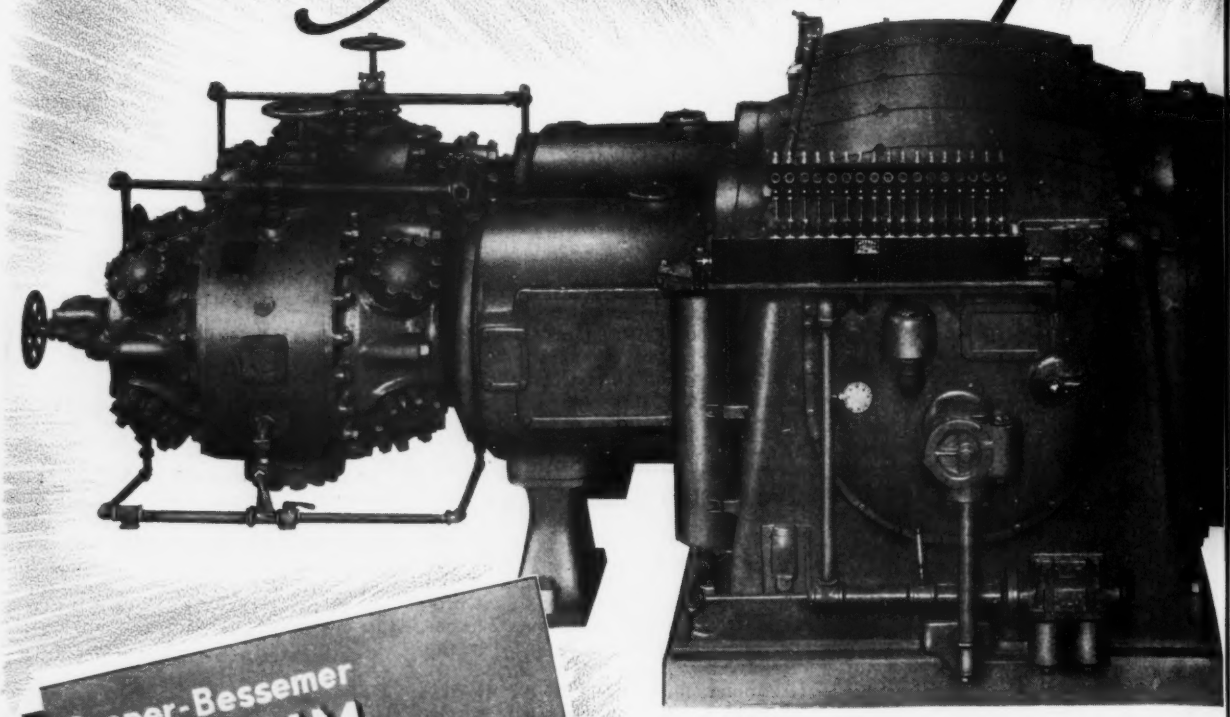
Operators had sought 640-acre spacing, and the landowners protested in favor of a 160-acre regulation, with the board settling on 320 acres.

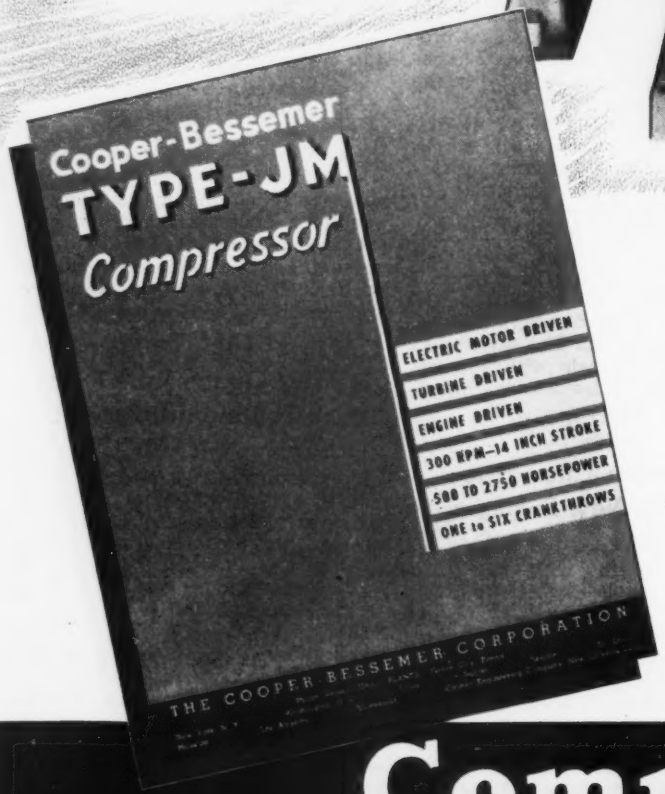
Hearing Opens June 9 on Trans-Continental Project

WASHINGTON. — The Federal Power Commission will open a hearing here June 9 on one of the major pending natural-gas construction projects, the proposal of Trans-Continental Gas Pipe Line Co., Inc., to build a pipe-line system from Texas to the Eastern Seaboard.

Among the issues presented by the application, according to the commission's order, are whether: (1) the proposed facilities and method of operation are adequate to render the service planned; (2) construction is economically feasible and the costs reasonable; (3) the company has sufficient financial resources to construct, operate, and maintain the facilities; (4) the company has reasonably adequate natural-gas reserves dedicated to assure a continuing gas supply for the project.

Introducing a





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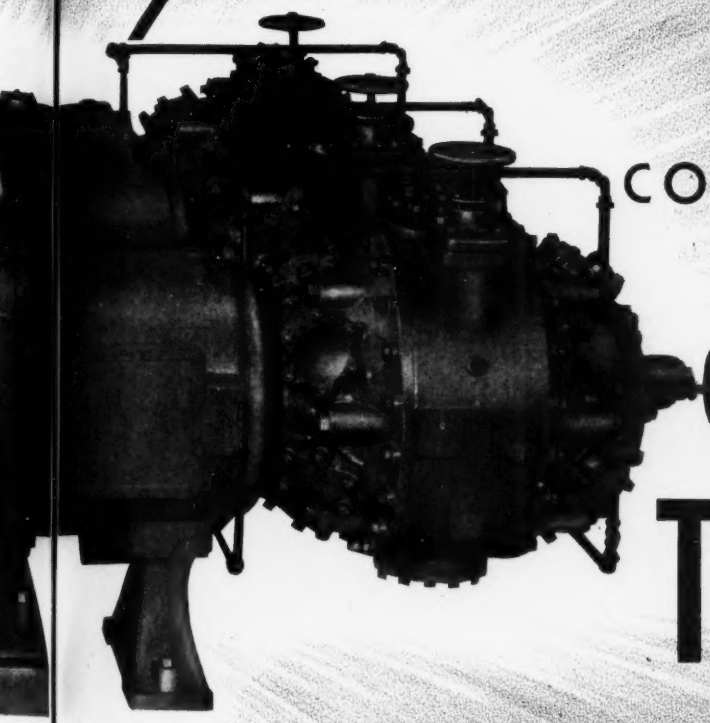

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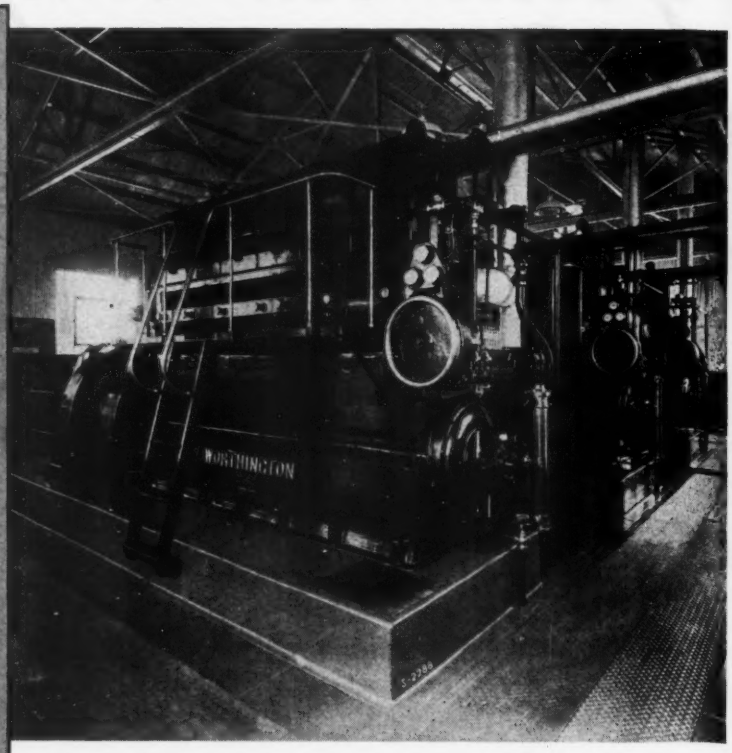

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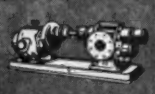
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Exploration and Drilling

Geophysicists Entering a New Era

by Charles J. Deegan

VARIOUS items of news, announcements, the type of program, and the general atmosphere surrounding the regional geophysical meeting in Tulsa last week all added up to more confirmation of the fact that the petroleum geophysicists are entering a new era.

The registration of exactly 325 was remarkable for a regional meeting of a society whose total membership is only 1,400 plus. This was the first regional meeting ever held under the auspices of a local chapter. That chapter (Geophysical Society of Tulsa) formally organized only this spring, is the first such local unit to be established under the rule of the national society.

The Tulsa meeting followed by only a few weeks, a regional gathering at Houston, at which slightly over 300 were registered. A third regional meeting is scheduled for Pittsburgh on June 6. These three regional meetings, coming within about 2 months of the national convention at Los Angeles will draw an attendance about equal to 50 per cent of the society's total membership. Considering the attendance at Los Angeles, and making due allowance for overlapping attendance at more than one meeting, at least 60 per cent of the individual members of the Society of Exploration Geophysicists will have attended a meeting within a period of about 2 months.

Keen Interest Indicated

This is some kind of a record for professional societies. It obviously indicates the keenest kind of interest in their work on the part of the members; and it speaks volumes for the caliber of the programs arranged.

Two significant events were announced at the meeting. First, formal arrangements have been concluded by S.E.G. with University of Tulsa whereby the latter will become a depository for all the exchange scientific publications received by S.E.G., including many from foreign countries. Second, the first student chapter of S.E.G. has been formed at University of Tulsa.

In connection with the library depository, President C. I. Pontius of the University stated that plans are under way by which it is hoped to obtain microfilming facilities. If these should mature, the university will set up a service so that members of S.E.G. can obtain microfilm copies of any literature in the depository. In response, President Green of S.E.G. said, smilingly, that judging from all of these developments, it appeared that Tulsa was staking out a claim to the title "Geophysical Capital of the World."

Past President Henry Cortes announced that the "Case History Volume" was developing rapidly and should be ready for distribution this fall. However, he stated that there was still room for a few more papers. He expressed the hope that those oil-producing companies, not as yet represented by a case-history paper, would select a field and assign a geophysicist to the task of preparing such a paper in time to be included in the printed volume.

Secrecy Being Discarded

There was widespread comment among those attending to the effect that the days of extreme secrecy in geophysics seemed to be passing rapidly. Among other things the new era is bringing, they agreed, is the realization that the individual geophysicists and their companies have more to gain than they can possibly lose by getting together and exchanging much more scientific data and experience than has been customary in the past. This pattern of course follows exactly the experience of the geologists, paleontologists, petroleum engineers, chemists, and other professions active in the industry.

The problem was stated to be one of drawing the line between information that must be kept secret for competitive advantage, and that which should be exchanged freely for the mutual benefit of all. That problem had been solved by the geologists, and it was felt that the geophysicists' problem presented many parallels. Most members seemed to think that in the light of hindsight, the line between competitive advantage and mutual benefit had in the past been mistakenly drawn too far on the side of secrecy.

The technical program consisted of 14 papers, in addition to a feature talk at the luncheon on the subject of "Mining Exploration in Canada," by Dr. Arthur A. Brant, of Toronto University. The caliber of the papers, plus the ingenuity of the arrangements committee in providing short recess breaks at intervals, kept almost the entire registration in constant attendance at both day and night sessions. In fact, if anything, the night session developed more discussion from the floor than those during the day.

Papers on Gravity Work

Of the 14 papers presented, only 7 had been presented on the formal program at Los Angeles. Four papers were presented that were not included at the annual meeting; two papers presented at Tulsa had been read by title only in California; and one, that on the Decca system of surveying, had been partly discussed in a private meeting during the annual convention.

Two of the new papers dealt with gravity work. The paper, "A New Gravity Meter," by S. P. Worden, of Houston Technical Laboratory, aroused considerable interest because of several innovations. The height of the instrument is only 13 in. and it weighs only about 6 lb. It represents a substantial departure in many construction features from the conventional types.

Equally interesting, because it represented something spectacular, was "Gravity Meter Survey by Use of a Helicopter," presented by Eugene Frowe of Robert Ray, Inc. There was some comment on the fact that only last year at the Chicago meeting, the same speaker, for the same firm, had presented a paper on the use of diving bells in gravity work. (The Oil and Gas Journal, June 15, 1746, page 98).

The other two new papers were, "Magnetic Properties of Granite and Granite Wash," presented by Garvin Taylor of Stanolind Oil & Gas Co., and "Instrumentation for the Determination of the Magnetic Properties of Rocks," presented by Dan Silverman, of Stanolind. These were companion papers, the first discussing results and uses, while the second discussed the instrumentation of the devices used to secure the results.

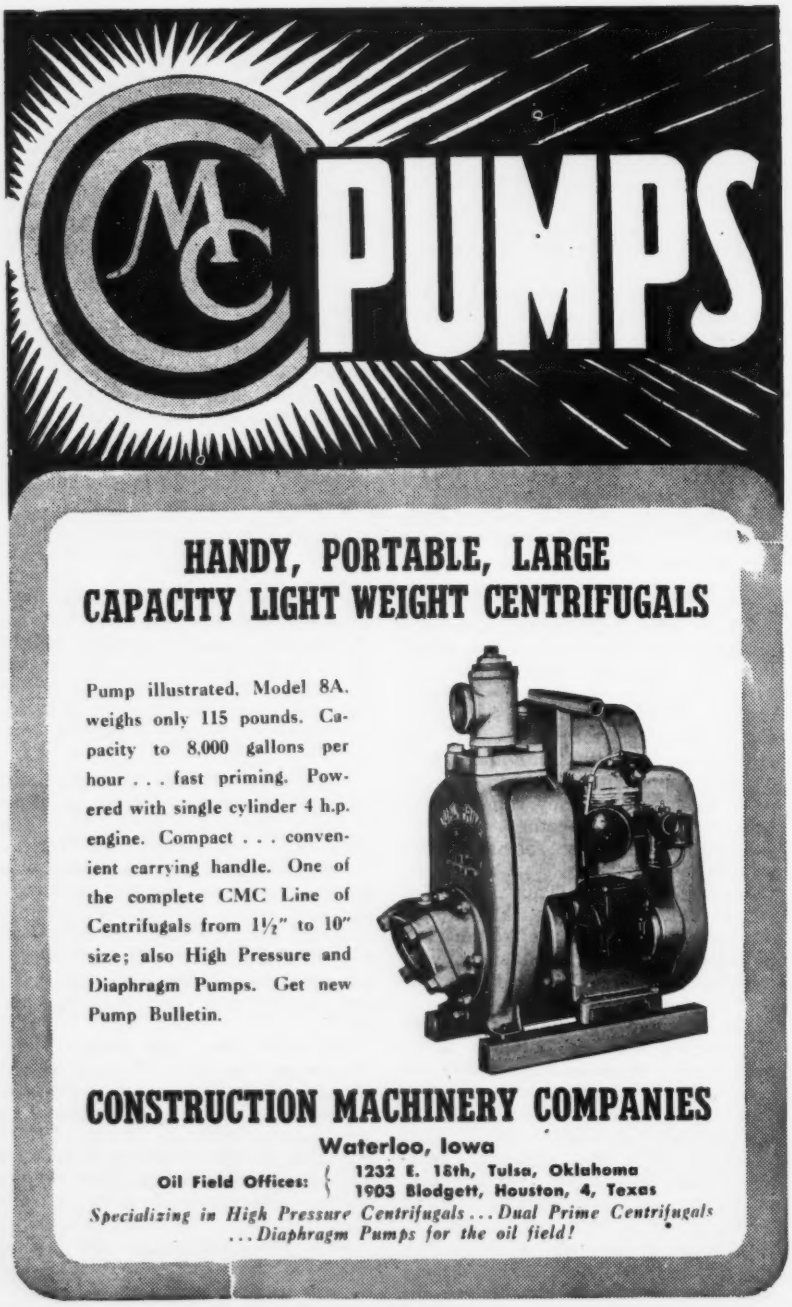
EASTERN TEXAS

Magnolia Continues Testing At Houston County Well

DALLAS. — Magnolia Petroleum Co. 1 J. W. Grounds, 6 miles southeast of Grapeland, Houston County, continued to swab Glen Rose perforations at 8,922-45 ft., which has produced some oil, acid water, and a slight amount of gas. A drill-stem test, with packer at 8,896 ft., flowed acid water for 35 minutes, steady, then flowed by heads, making a small amount of oil which increased from 20 to 30 per cent. Operators then swabbed fluid from 100 ft. from top to 6,600 ft., recovering mostly acid water. Gas increased while the well was swabbed. Shut in 9 hours, fluid rose to within 600 ft. of top. Swabbed down 1,000 ft., the recovery was 90 per cent oil and 10 per cent acid water, but the second 1,000 ft. of fluid reversed this ratio, with only 10 per cent being oil. On the latest test, 13 trips of the swab recovered 120 gal. of oil and 73 gal. of acid water.

Magnolia 1 Hall Estate, deep test in Lassiter field, Marion County, perforated at 8,736-50 ft. in the Travis Peak, in addition to perforating on bottom at 8,754 ft. The well is plugged back to 8,755 ft., from 10,241 ft. After washing in, and running the swab four times, it started flowing gas and wash water and was allowed to clean itself. Turned into tanks, it flowed 52 bbl. of 60.8° distillate in 19 hours through 18/64-in. choke Tubing pressure was 1,000 lb., and gas was gaged at 12,350,000 cu. ft. The well then flowed 34 bbl. of distillate and 11 bbl. of fresh water in 11 hours. On a second 11-hour potential test, it made 44 bbl. of distillate and 6 bbl. of fresh water, flowing through ¾-in. choke, with tubing pressure at 3,200 lb., casing pressure 600 lb., and gas at 2,906,000 cu. ft. a day.

Tide Water Associated Oil Co. and Seaboard Oil Co. 2 Dalby & Joiner, 4 miles southwest of Dalby Springs, was drilling below 4,497 ft. in shale and limestone. It was said to have gas shows in the Paluxy. Possible gas shows were unconfirmed and top of the zone was not reported. Location is 6,000 ft. south of a 4,825-ft. Paluxy failure which carried water.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TEXAS GULF COAST

Lucky Field Discovery Flows 79.34 Bbl.

HOUSTON. — Stanolind Oil & Gas Co. made an initial production gage from the new South Lucky field discovery, 2 miles south of Lucky field, Matagorda County. The well, 1 Marcus D. Heubner, Peter Bertrand Survey, flowed 79.34 bbl. of 36°-gravity pipe-line oil after running tubing with perforations at 9,236-38 ft. Flowing pressure on the tubing using a ⅛-in. choke was 890 lb. and had a gas ratio of 1,570 to 1. Total depth of the hole is 12,776 ft. A test in the upper part of the sand, perforations at 9,220-31 ft., flowed at the rate of 2,300,000 cu. ft. of gas per day.

New deep production for Amelia field of Jefferson County was indicated in Humble Oil & Refining Co. 12 R. J. Peveto, 9,000-ft. test in the C. Williams Survey. Hole was being drilled at 8,283 ft. when it started flowing, but was controlled and mudded down. Drilling operations are to be resumed.

An initial production try of Magnolia Petroleum Co.'s confirmation test at Glendale in Trinity County, failed when the well would not flow. Hole bottom at 10,658 ft., has 7-in. pipe 1 ft. from the total depth, and pipe was perforated with 55 shots from 10,647-57 ft. for the test. Prior to running of tubing, a drill-stem test here recovered gas, mud and some evidence of condensate. Hole was swabbed to 8,800 ft. in an effort to get the well to flow. It is the 3 Bolton, a mile northwest of the 2 Bolton discovery gas and condensate producer, and is in Lot 65 of the Henry Bond League.

A new test was made in Magnolia 1-A Linderholm, wildcat, a 1¼-mile south extention to Chesterville field of Colorado County, the test being in Wharton County. Initial tests were made from perforations at 9,656-9,716 ft. where it flowed gas, condensate, and salt water. The current test is being made with 120 holes shot at 9,653-73 ft. A drill-stem test recovered only the 4,000 ft. of water cushion in an opening of 1 hour, with no other evidence of shows reported.

Sun Oil Co. is still unsuccessful in recompletion of the 1 White & West, South Call discovery, Newton County. A test of perforations at 10,610-45 ft. failed to flow and swabbed 7,300 ft. where it showed some oil, gas, mud, and salt water. A new test was made of 76 perforations at 10,535-54 ft., where it failed to flow again, and swabbed gas, salt water, and a slight amount of oil. Perforations were squeezed and another squeeze job made at 10,320-23 ft., after which another test will be conducted.

Two tests in Sun's wildcat test off the northwest flank of production at Orange dome in Orange County, the 2 Lutcher-Moore Lumber Co., James Dyson Survey, failed to show commercially. Perforations at 8,572-94 ft. flowed salt water at the rate of 175 bbl. daily, while another test made through perforations at 8,524-38 ft. failed to flow and was swabbing for a recovery.

A potential gage was run in Plymouth

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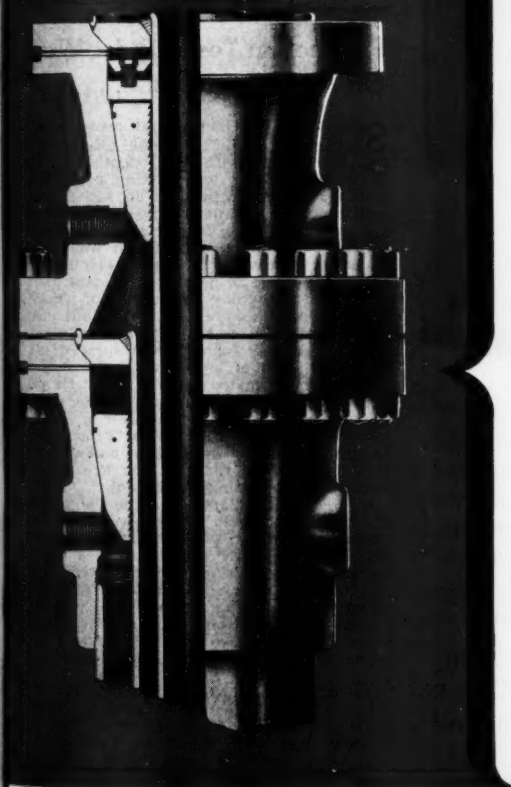

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ASSOCIATION OF WELL HEAD EQUIPMENT MANUFACTURERS CERTIFIED

Oil Co. 6 F. H. Ficke, new oil-sand discovery at East White Point field, San Patricio County. It flowed 64.83 bbl. of 44.4°-gravity oil per day with no water and a gas-oil ratio of 5,013 to 1 from perforations with nine shots at 6,392-94 ft. Tubing pressure was 1,775 lb. and flow was through a 9/64-in. choke. Total depth was 6,515 ft. and top of pay was logged at 6,376 ft.

TEXAS GULF COAST SUCCESSFUL WILDCATS

Goliad County: New condensate field discovery, Hords Creek-Wilcox, W. L. Goldston 1 Jennie Ray Kauffman, 5½ mi. SW of Charco, Blk. 13, F. P. Zoch O&G Subd. P. Trevino Sur., TD 8,600 ft., top pay 7,900 ft., perf. 7,900-20 ft., IP 6,600,000 cu. ft. gas per day and estimated 40 bbl. condensate per day, ¼-in. choke, TP 2,000 lb., no water.

Harris County: New condensate field discovery, San Jacinto, Houston Oil Co. of Texas 1 Eugene L. Bender Estate, 3 mi. off east flank of Humble dome, J. W. Singleton Sur., TD 8,600 ft., top pay 7,782 ft., perf. 7,782-90 ft., IP 1,867,000 cu. ft. gas daily and 58 bbl. condensate per day, ¼-in. choke, TP 1,250 lb., 66.5° grav., no water.

Wharton County: New gas-condensate field, unnamed—Floyd L. Karsten 1 C. L. Tucker, Sec. 24, Mark Weiss Sur., 3½ mi. west of Withers field, TD 7,352 ft., top pay 7,080 ft., perf. 7,081-86 ft., shut in with no gage, TP 2,750 lb., 54°-grav. condensate, estimated 30,000,000 cu. ft. gas daily open flow, no water.

New gas pay, Prasifka field—H. C. Cockburn 1 Josephine Blauvelt, S. Castleman Sur., 3,000 ft. S of 1 Wharton Bank & Trust Co. discovery, TD 5,616 ft., top pay 4,204 ft., perf. 4,204-14 ft., IP 2,500,000 cu. ft. gas daily, ¼-in. choke, TP 1,675 lb., no water. Estimated open flow 25,000,000 cu. ft. gas daily.

New gas field, West Withers—Floyd L. Karsten 2 J. C. Carlson, W. D. Ivey Sur., Sec. 44, 1 mi. W of Withers field oil production, top pay 5.514 ft., TD 5,544 ft., perf. 5,514-16 ft., IP 940,000 cu. ft. gas daily, ⅛-in. choke, TP 1,800 lb., no water.

TEXAS GULF COAST WILDCAT FAILURES

Austin County: Phillips Pet. Co. 1 Louise Shultz et al (Shul), Jno. Hodge Sur., deep test off S flank Brenham dome, dry, TD 10,524 ft.

Chambers County: Peeler Bros. & Lohman & Gardiner 1 Theodor Low Estate, 1½ mi. SW Elm Bayou prod., Sec. 106, HT&B Sur., dry, TD 8,517 ft.

Colorado County: Chicago Corp. et al 1 Dennis, Eagle Lake area, Jas. Earl Sur., 4 mi. S of Ramsey field, dry, TD 11,163 ft.

Fort Bend County: Wesley W. West 1 Albert Van Steenbergh, Andrew Northington Lge., 2 mi. SE of E. Bernard townsite, dry, TD 7,574 ft.

Goliad County: Ginther, Warren & Ginther 5 Carrie G. Wood et al, Caleb Bennett Sur., 3½ mi. S of Sarco Creek field, jetted 20 bbl. fluid, 15 per cent oil, 85 per cent salt water per day from perf. 4,998-5,013 ft., TD 5,500 ft.

Harris County: Floyd L. Karsten 1 Mary Edith Giles, Cypress area, 1 mi. E-NE of Josey Ranch gas production, Evans Thomas Sur., dry, TD 7,020 ft.

Wharton County: Grubb & Hawkins 2 Rudolph C. Peters, Gobbler Creek discovery area, Lyman Conkrite Sur., 1,000 ft. W-SW of 1 Peters discovery, dry, TD 5,783 ft.

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LA.-ARK.

Production Tests Under Way On Ajax Area Test

SHREVEPORT.—In the Ajax area, Natchitoches Parish, J. F. Lent et al 1 E. L. Whatley, 20-10n-10w, with total depth at 3,530 ft. in the Paluxy, was making production tests. From perforations at 3,279-95 ft., the well made an estimated 2,500,000 cu. ft of gas a day, spraying 20 bbl. of oil, and cutting small amounts of brackish water. Oil tested 41.0°-gravity. It then flowed 15 bbl. of fluid, cutting 30 per cent sediment; then 18 bbl. of oil a day through ¼-in. choke, at a tubing pressure of 190 lb., but died at the end of 72 hours. Shut in over night, it was swabbed 1 hour, then sprayed salt water for 1 hour, after which it started flowing an estimated 1,000,000 cu. ft. of gas with a spray of oil. Operators shut down for orders. Seven miles southwest of Natchitoches, H. C. Cockburn et al 1 Louisiana Long Leaf Lumber Co., 11-8n-8w, had total depth at 5,345 ft. in the Fredericksburg, and was fishing drill pipe.

In Red River Parish, 4 miles northeast of Bull Bayou field, British-American Oil Producing Co. 1 T. Wimberly, NW SW SE 2-13n-10w, was showing for a small pumper. Latest perforations reported were in the Tuscaloosa at 2,677-79 ft., after which it swabbed 12 bbl. of fluid per hour, cutting 15 per cent oil, of 42° gravity. Operators were to make further tests on the pump. On an elevation of 190 ft., the Tuscaloosa sand was found at 2,676-2,707 ft. Total depth was 7,508 ft. in Travis Peak.

In Columbia County, Arkansas, Placid Oil Co. 1 Farmers Bank & Trust, CSE 1-17s-20w, had total depth at 7,438 ft. in Smackover and was preparing to make an open-hole production test at 7,433-38 ft. after a drill-stem test at that interval recovered 30 ft. of 58.9°-gravity diistillate in 20 minutes.

Three and one-half miles west of New Lond field, Union County, Arrow Drilling Co. 2-A Union Saw Mill, 8-18s-12w, was shut down for repairs at 3,430 ft. No shows have been reported at or near total depth but cores at 2,943-53 ft. recovered coarse.

sandy ash with a show of oil. A drill-stem test at that depth, however, recovered only salt water. Chicago Corp. 1 Baker-Strange Realty Co., SE NW NE 11-16s-24w, Lafayette County, was drilling below 3,690 ft. Cores at 3,217-35 ft. recovered a fine sand having spotted oil stains, and salty taste.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Bienville Parish: Lion Oil Co. 1 Ozley, SW NE 13-17n-6w, flowed 40,000,000 cu. ft. gas a day, plus 8 bbl. distillate per 1,000,000 cu. ft., gas-oil ratio 125,000:1, perforated 7,696-7,736 ft. in Travis Peak, TD 10,744 ft., elev. 270 ft.

NORTH LOUISIANA WILDCAT FAILURES

Caddo Parish: Bering Oil Co. 1 Muslow, NE SW 5-20n-15w, dry, TD 7,340 ft., no tops reported.

Union Parish: Shell Oil Co., Inc. 5 Frost, SW NE 31-23n-2e, dry, TD 3,131 ft., no tops reported.

Shell 6 Frost, NW NW 13-23n-1e, dry, TD 3,054 ft., no tops reported.

ARKANSAS WILDCAT FAILURE

Ashley County: McAlester Fuel Co. 1-A Crossett Lumber Co., NE SE 28-15s-6w, dry, TD 3,810 ft., Midway 2,570 ft., gas rock 3,147 ft., Nacatoch sand 3,313 ft., elev. 187 ft.

Clark County: W. H. Littlejohn 1 Suytor, SW SW SE 3-8s-18w, dry, TD 1,054 ft.

Drew County: C. A. Kinard 1 A. S. Reinhart, NW SE SW 15-12s-6w, dry, TD 4,523 ft., gas rock 3,536-3,626 ft., Nacatoch 3,668-3,900 ft., Eagle Mills 4,298 ft., elev. 209 ft.

PERMIAN BASIN

Testing Continues At Ellenburger Discovery

MIDLAND.—Testing, with new perforations throughout the entire pay section, was still under way at Gulf Oil Corp. 1-HH University, Ellenburger discovery 3½ miles north of Block 31 field, eastern Crane County. New shots were placed at 10,685-90 ft., 10,715-40 ft., 10,810-30 ft., and 10,850-75 ft. Total depth is 10,920 ft. The well had made a flow of 97 bbl. of fluid, of which 92 bbl. was oil, 2 bbl. of water, and 3 bbl. of sediment. At the end of 19 hours, the well was heading four times an hour and averaging 6.9 bbl. of fluid per head. Drilling water and sediment were decreasing as the well continued to clean itself.

In northeastern Crockett County, Amerada Petroleum Corp. 1-CTA University, was drilling ahead below 8,628 ft. in Ellenburger limestone, topped at 8,102 ft., on an elevation of 2,613 ft. It is credited with having two zones showing for commercial production.

In Scurry County, Ohio Oil Co. 1-C J. W. Neal, 11 miles west and slightly north of Rotan, recovered 30 ft. of drilling mud, with a slight show of gas, on a 45-minute drill-stem test in the Ellenburger at 7,269-80 ft. Operators were drilling ahead. Last week this test attracted considerable interest when it was reported to have had oil shows in the Ellenburger.

In Crockett County, Cities Service Oil Co. et al 1-B J. W. Owens, Wolfcamp prospect, 1½ miles south of Olson field, was reported drilling ahead below 7,945 ft. in limestone. No further oil shows have been reported past the Wolfcamp.

In southeastern Reeves County, about 6 miles east and slightly north of Saragosa, Argo Oil Corp. 1 Roberts continued testing. Drilled to 14,073 ft., then plugged back to 10,053 ft. in the lower Permian, the well has made several 1-hour heads over the past several weeks. Latest report is that when opened it flowed 77 bbl. of oil in 1 hour and 40 minutes, through tubing, before dying. The following day it flowed 64 bbl. of oil in 1 hour and 50 minutes, in what was probably the longest sustained flow made so far. Latest tests continued over a 4-day period. On the third day, it flowed by heads, making 35 bbl. of oil and 15 bbl. of water, and on the fourth day, flowed 5 bbl. of oil before being shut in.

Gulf Oil Corp. 42½-D Goldsmith, Devonian discovery in Goldsmith field (San Andres) of northwestern Ector County, increased the flow of oil to 266 bbl. after acid treatment. This well was completed recently for 127 bbl. of oil, plus 163 bbl. of water. Operators continued testing in an effort to reduce the water.

Shell Oil Co., Inc. 1 Mrs. M. E. Cochran, Devonian prospect near the Ector-Winkler County lines, was showing some oil, drilling water, and drilling mud. Operators were cleaning out to 8,150 ft. Location is 1 mile east and ¼-mile north of the most northwesterly Devonian producer in the TXL field, but separated by a 9,923-ft. dry hole.

WEST TEXAS WILDCAT FAILURES

Garza County: T. C. Huddle 1 Sam Sanders, Sec. 1,233, EL&RR Sur., 2 mi. NW Post, dry, TD 3,227 ft., anhydrite 990 ft., San Andres 2,490 ft., elev. 2,678 ft.

Mitchell County: Cosden Petroleum Corp. 1 C. L. Jones, Sec. 60, Blk. 20, Lavaca Navigation Co. Sur., 4 mi. NE Vincent, dry, TD 5,925 ft., trace dead oil 3,1001 10 ft., Yates 1,025 ft., brown limestone 1,979 ft., San Andres 2,045 ft., Glorietta 2,845 ft., Clear Fork 3,032 ft., Westbrook field pay zone dry at 3,335 ft., elev. 2,314 ft.

Pecos County: G. F. Aldrich 1 Mueller-Shell, Sec. 118, Blk. 10, H&GN Sur., 6 mi. SE Buena Vista, dry, TD 2,118 ft., salt 805 ft., San Andres 2,025 ft., elev. 2,362 ft.

Schleicher County: F. A. Callery 1 S. E. Jones, Sec. 31, Blk. K, GH&SA Sur., 8

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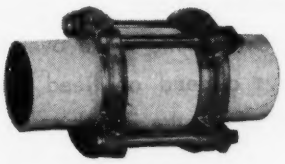

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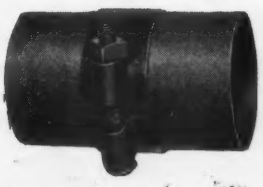

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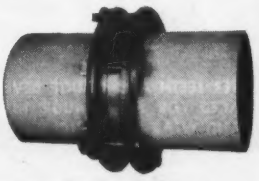

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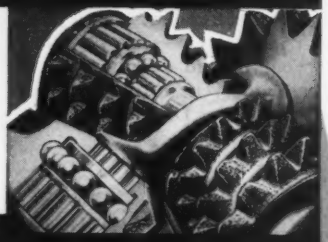

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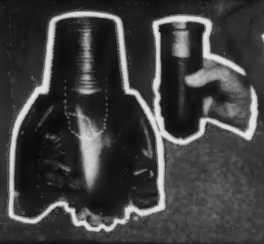

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mi. SE Page field, dry, TD 6,001 ft., Palo Pinto 3,950 ft., Strawn 4,460 ft., Ellenburger 5,350 ft., elevation 2,278 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Amerada Petroleum Co. has an Ellenburger test under way in Monument field of Lea County, at its 5 Phillips, NE NE 1-20s-36e. On last report it was below 2,379 ft. in anhydrite. The Texas Co. 1-AK State, SE SE 16-16s-38e, was drilling below 6,277 ft. in limestone. Between Maljamer and South fields, Page & Yates 1 Stroup, 10-18s-32e, was drilling below 4,975 ft. in sand. It was originally scheduled to 4,800 ft.

In Eddy County, Grayburg Oil Co. 13-B Keeley, 26-17s-29e, southwest flank test at Grayburg-Jackson, swabbed 83 bbl. of water and 23 bbl. of oil after treating with acid, and shut down.

In southern Chaves County, Richfield Oil Corp. 1 Mullis, 21-15s-29e, was drilling below 10,636 ft in limestone. It is the county's deepest test, and is being deepened from its old total depth of 5,675 ft.

MICHIGAN

Twenty-Three New Locations Are Announced

SAGINAW.—Nine gas wells with a combined initial potential of 63,400,000 cu. ft, and 3 oil wells combined for 240 bbl. a day were among the 20 completions in Michigan oil and gas fields for the week, while 23 new locations were announced. Bulk of the new gas potential came from Newaygo County's Goodwell field, the new oil wells being a 25-bbl. Arenac County development, one good for 185 bbl. in Isabella County and another for 30 bbl. in Montcalm County. Five of the dry holes were wildcats; a sixth got a small gas yield in Roscommon County's Richfield Township.

Sun Oil Co. announced six of the new locations for operations in Garfield Township, Newaygo County, and another one in Newaygo's Big Prairie Township. Three other locations are in Bay County, three in Clare, two each in Allegan, Missaukee and Oceana, one each in Tyscola, Oscoda,, Osceola, and Arenac.

MICHIGAN WILDCAT FAILURES

Allegan County, Monterey Township: Charles W. Cook 1 Hervig Estate, NE NE SW 34-3n-13w, dry in Traverse limestone, TD 1,617 ft.

Isabella County, Sherman Township: H. E. Bell and Hunter Atha 1 Carr Brothers, NW NW SW 25-15n-6w, dry in Dundee, TD 3,738 ft.

Mecosta County, Martiny Township: Rowmor Corp.-F. T. Rand-John Meyer 1 Shirl R Baker, NE SE SW 33-15n-8w, dry in Detroit River formation, TD 3,752 ft.

Newaygo County, Brooks Township: H. E. Walton 1 E. O. and Mable Pickett, NE SW SW 5-12n-12w, dry in Traverse limestone; TD 2,387 ft.

Ottawa County, Zeeland Township: Tri-County Development Co. 1 A. and M. Gilder, C-SE SW 2-5n-14w, dry in Berea, TD 914 ft.

SUCCESSFUL MICHIGAN WILDCAT

Roscommon County, Richfield Township: Sun Oil Co. D-1 State-Richfield, C-NE SE 24-24n-1w, gas well, 800,000 cu. ft., TD 4,290 ft.

SOUTHWEST TEXAS

Deeper Pay Zone Discovery Gages 77 Bbl.

CORPUS CHRISTI.—A potential flow was made of Standard Oil Co. of Texas' new deeper pay zone discovery at Alta Mesa field in Brooks County, 33 Mestena Oil & Gas Co. Perforations in the new oil sands were at 5,194-5,203 ft., and gaged 77 bbl. of 45.1°-gravity oil per day on a 3/16-in. choke. Tubing pressure was 150 lb. with casing on seal, and had a gas ratio of 881 to 1. There was no water with the flow.

The East Alta Mesa oil discovery well, Standard of Texas 7 B. G. de Garcia, Lease 1, made only a small high-ratio oil-salt water well, gaging 9 bbl. oil and 7 bbl. salt water per day on a 3/32-in. choke with gas ratio of 12,586 to 1 from perforations at 6,322-24 ft. Flowing pressure on the tubing was 1,975 lb. and oil was 42.8° gravity. The well is 4,200 ft. north-northeast of the 4 de Garcia discovery gas-condensate well and in La Encantada Grant.

Three and one-half miles east of Randado in Jim Hogg County, Cam Corp. 1 John Allen, H&GN Survey 29, tested salt water from the Colorado sand with perforations at 3,501-06 ft., and now is testing gas from perforations at 2,632-37 ft., with no gage reported yet. Total depth is 3,544 ft.

Skinner & Eddy, Inc. and Newman Brothers pumped a potential gage of 77.28 bbl. 32.8°-gravity oil per day, plus 75 per cent fresh water, no gas from 1-C South Texas Syndicate, new oil-field discovery in southeastern LaSalle County, 7 miles south of Washburn field. Production is from the top of the Carrizo zone of the Wilcox series with perforations for completion at 3,638-58 ft. It is a rework of the old Quintana Petroleum 1-F South Texas Syndicate dry hole which was drilled in April 1945 and abandoned at a total depth of 6,638 ft.

Southern Minerals Corp. 3 Juan Benavides, extension well about 1¼ miles south-southwest of the discovery of Cam field, southwestern Duval County, flowed 30 bbl. oil per day, plus 40 per cent salt water from perforations 2,638-48 ft. Hole was bottomed at 2,666 ft. The well is located in the west corner of Block 4, First Subdivision of Mesquite Oil & Gas and J. Carpenter Subdivision El Mesquite Grant.

Renwar Oil Corp. 1 W. B. McCampbell, new oil-field discovery ⅛ mile east of Turkey Creek field, Nueces County, flowed a potential of 39.99 bbl. 35.5°-gravity oil per day, plus 7.92 per cent water. Gage was through a 7/64-in. choke from perforations at 5,542-52 ft. Flowing pressure on the tubing was 1,430 lb. and had 1,975 lb. pressure on the casing. Total depth of the hole is 9,014 ft. with 5½-in. casing set to 7,016 ft. The well spots on BS&F Survey 421.

In northwestern Nueces County, Curtis Singleton and W. H. Wallace of Corpus Christi have completed their 1 H. C. Mantor and R. C. Briggs as a new oil-field discovery, Block 16 of Briggs & Kuykendall Subdivision northwest of Banquete and northwest of North Agua Dulce field. The well flowed 240 bbl. of 32.2°-gravity oil per day with 1,100 lb. working pressure on a drill-stem test from perforations at 6,016-21 ft.

Humble Oil & Refining Co. ran a potential gage in the 1 J. T. Eppright, 1¼-mile east-northeast extension to Charlotte Edwards lime production in Atascosa County. It gaged 89.06 bbl. of 39.4°-gravity oil per day on a 3/16-in. choke with a gas ratio of 72 to 1. Tubing pressure was 300 lb. Flow is from open hole in the Edwards lime at 6,995-7,000 ft. which was perforated with 24 shots and acidized prior to completion. It is located on a 100-acre lease in J. H. Gibson Survey 1627, just off the north corner of Charlotte townsite.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Brooks County: New oil pay, Alta Mesa-Deep field—Standard of Texas 1 Mestena O. & G. Co., La Mestena Gonzalena Gr., Sec 5, top pay 5,194 ft., TD 6,658 ft., perf. 72 holes at 5,194-5,203 ft., IP 77 bbl. oil per day 3/16-in. choke, TP 150 lb., 45.1° gravity, no water.

Oil discovery, East Alta Mesa field—Standard of Texas 7 G. B. de Gardia, Lse. 1, Share 8-A, La Encantada Gr., top pay 6,315 ft., TD 6,500 ft., perf. 16 holes 6,322-24 ft., IP 9 bbl. net oil per day, 3/32-in. choke, TP 1,975 lb., gas-oil ratio 12,586 to 1, 42.8° gravity, 7 bbl. water per day.

La Salle County: New oil-field discovery—Newman Bros. Drilling Co. and Skinner & Eddy Corp. and W. S. Appleyard 1-C South Texas Syndicate, 15 mi. S-SW of Fowlerton and 7 mi. S of Washburn field, H&GN Sur. 76, top pay 3,638 ft., TD 6,639 ft., perf. 13 holes 3,638-58 ft., IP 77.28 bbl. oil per day on pump, plus 75 per cent fresh water., 32.8°-gravity oil.

Neuces County: New oil-field discovery, Viola field—Renwar Oil Corp. 1 W. B. McCampbell et al, BS&F Sur. 421, 10 mi. W of Corpus Christi, top pay 5,530

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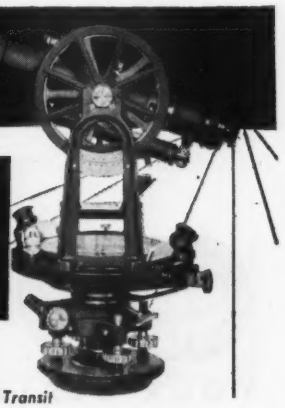

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ft., TD 9.014 ft., perf. 20 holes 5,542-52 ft., IP 39.99 bbl. oil per day 7/64-in. choke, gas-oil ratio 6,575 to 1, TP 1,975 lb., 35.5° gravity, 7.92 per cent water.

San Patricio: New oil pay, East White Point, Plymouth Oil Co. 6 F. H. Ficke, Geo. H. Paul Subd. of C. F. P. Co. lands, Sec. 50, top pay 6,376 ft., TD 6,615 ft., perf. 9 holes 6,392-94 ft., IP 64.83 bbl. oil per day 9/64-in. choke, gas-oil ratio 5,013-1, TP 1,775 lb., 44.4° gravity, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Atascosa County: Quintana Pet. Corp. 5 C. Muil, west outpost to Muil field, J. C. Mattison Sur. 467, TD 9,012 ft. in Edwards lime, dry.

Webb County: O. W. Killam 1 Marrs McLean, 1 mi. SE of McLean field, Sur. 122, tested salt water 3,364-70 ft., TD 3,490 ft., dry.

Zavala County: David S. Rig 1 Chas. D. Matthews, 4½ mi. W of La Pryor, Blk. 15, Sec. 20, I&GN Sur., drill-stem test at 2,330-60 ft. recovered 266 ft. oily mud, TD 2,730 ft., dry.

MISSISSIPPI

Lower Cretaceous Test Will Go to 12,000 Ft.

JACKSON.—A lower Cretaceous test in Heidelberg field of Jasper County was announced by Danciger Oil & Refining Co., Fort Worth. It will be the 1 Simmons, NE NE 36-1n-12e, in the Graben area of the northern part of the field. This test is said to be the first for the field, and scheduled depth is 12,000 ft. Drilling will be by company tools. The test is being supported by Gulf Refining Co., Tide Water Associated Oil Co., Midstates Oil Corp., and Texas Gulf Production Co.

Fourteen new locations for the state were announced this week. Of this total, eight are wildcat locations, indicating an increase of interest in north and north-central Mississippi. The most southern test is in Simpson County, with the seven other wildcats as follows: Two in Washington County, and one each in Attala, Hinds, Madison, Rankin, and Yazoo.

Four Wilcox completions in the La Grange field, Adams County, brought the total producers from that zone to 24, and giving the field approximately 1,200 proven acres. This area is said to be somewhat larger than the Wilcox producing zone at Cranfield. Present activity at La Grange includes seven drilling rigs that are under way.

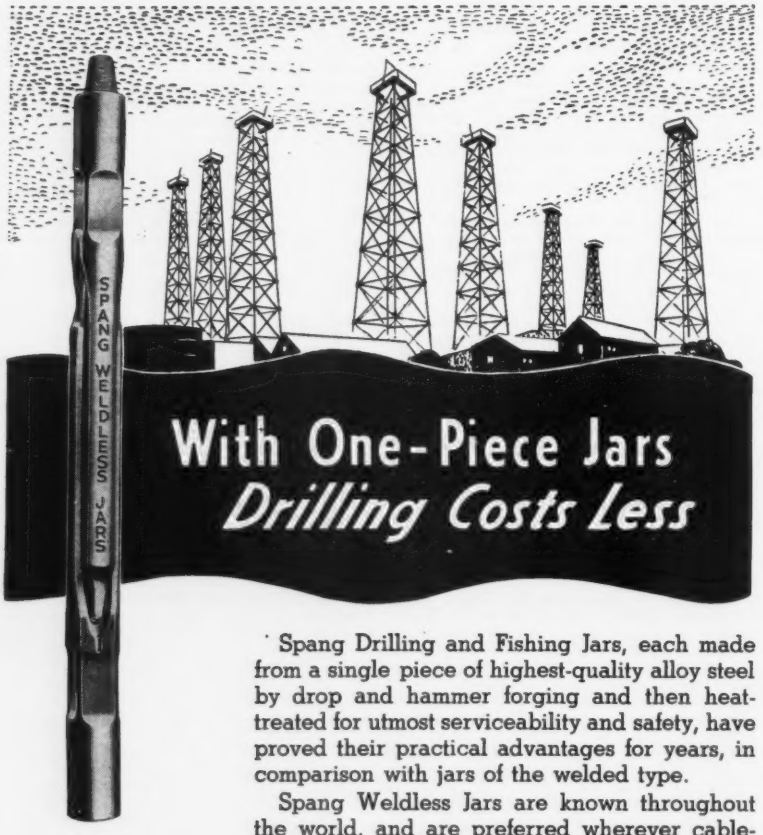
FLORIDA WILDCAT FAILURE

Marion County: Sun Oil Co. 1 Henry N. Camp, 16-17s-23e, dry, TD 4,637 ft. in igneous material, no tops or oil shows reported.

MISSISSIPPI WILDCAT FAILURES

Madison County: Gulf Refining Co. 1 J. R. Fancher, 25-10n-4e, dry, TD 6,462 ft., Marine Tuscaloosa 6,000 ft., Massive sand 6,174 ft., Comanche 6,398 ft., elev. 295 ft.

Washington County: C. H. Murphy, Jr., and Sun Oil Co. 1 N. L. Mayhall, 21-16n-7w, dry, TD 4,627 ft., no tops or shows reported.



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N. CENTRAL TEXAS

Montague County's Deepest Test Is Completed

WICHITA FALLS.—Three miles southeast of Montague, Continental Oil Co. completed its Strawn sand discovery, the 1 Paul Magee, C. A. Wright Survey, A-1,052, as the first in the south half of Montague County, and as the deepest test for the county. The well made 159 bbl. of 40°-gravity oil in 24 hours, from perforations at 6,018-38 ft. Location is 3½ miles east of conglomerate production in Lewis-Stuart field. The 1 Magee was carried to the Ellenburger, which was dry.

In northern Montague County, an important wildcat was to get under way at Youngblood & Foree 1 Lester Howard. It is to be a 6,500-ft. test and is located in Block 1, Jack County School Land, about 1 mile southwest of the same operator's 2 Benton, Bend conglomerate discovery in Caudle field. A separate structure is sought as the two locations are separated by a 6,200-ft. dry hole.

Six and one-half miles north of Guthrie, in an untried area, Ohio Oil Co. 1 S. B. Burnett, King County wildcat, reported a show of oil but recovered only gas on a drill-stem test. The oil show was reported to be in limestone at 5,559-63 ft. Operators made a 20-minute test between 5,561-95 ft., using a 400-ft. water blanket. Recovery was the water cushion, 90 ft. of drilling mud, and 270 ft. of gas-cut mud. Bottom-hole pressure rose to 2,250 lb. in 10 minutes. It was drilling ahead below 5,725 ft. on last report.

In southeastern Baylor County, Ashland Oil & Refining Co. 1 Martin, prospective Ellenburger discovery, was reported to have swabbed 50 bbl. of oil after being shut in 14 days It was shut in again after swabbing the oil. Location is 1 mile north of Westover, in Block 3,114, TE&L Survey, and about 2 miles northwest of production in Mills field. Several tests have been made to the Ellenburger but this is said to be the county's first Ellenburger production.

Regular pay is from the Canyon limestone and Gunsite sand, of Pennsylvanian age.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Throckmorton County: D. T. Potts and G. H. Craig 1 A. L. Whitaker, Sec. 956, TE&L Sur., 6 mi. NW Woodson, gas discovery, shut in, estimated 300,000 cu. ft. gas a day, sand 997-998 ft., TD.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCATS

Montague County: New field—Continental Oil Co. 1 Paul Magee, C. A. Wright Sur. A-1,052, 3 mi. SE Montague, pumped 159 bbl. of 40°-gravity oil a day, no water, Strawn top 6,008 ft., perf. 6,018-38 ft., TD 6,638 ft., final plug-back depth 6,062 ft., elev. 1,058 ft.

Wilbarger County: Paradise Oil Co. 2 W. T. Waggoner, Sec. 11, Blk. 4, H&TC Sur., 4½ mi. SW Harrold, pumped 14.7 bbl. 30°-gravity oil a day, limestone 3,113-20 ft., TD 3,640 ft.

Paradise Oil Co. 1 W. T. Waggoner, Sec. 37, Blk. 14, H&TC Sur., 7 mi. S Oklaunion, estimated 241,000 cu. ft. gas a day, shut in, TD 2,650 ft., perf. 1,983-2,176 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Clay County: L. T. Burns 1 J. A. Hughes, Blk. 2, Clark & Plumb Subd., 4 mi. SE Scotland, dry, TD 5,998 ft., Caddo 5,333 ft. had faint odor, show oil 5,266-86 ft., lower Caddo had show oil 5,445-65 ft.

Cooke County: Redman Bros. I J. M. Conyers, H. Ledbetter Sur., A-601, 5 mi. NE St. Jo, dry, TD 1,744 ft., pumped 21 bbl. oil and 200 bbl. salt water.

Wichita County: J. R. Frankel 1 J. B. Wright, Blk. 11, RRVL Sur., 3 mi. SW Burkburnett, dry, TD 3,197 ft., Canyon reef 1,742 ft., Canyon limestone 2,987 ft.

Frank Wood et al 1 C. C. VanLoh, Sec. 4, BS&F Sur., 3 mi. SW Clara, dry, TD 2,015 ft. shale and sand with oil 1,882-85 ft., sand with show oil 1,970-75 ft.

KANSAS

Butler County Wildcat Operations at High Level

J M. HUBER et al 1 Gardiner, SW SW NW 15-28s-6e, Butler County, located about 1½ miles south of Kramer-Stearn pool, is completed as a 35-bbl. pumper in Viola topped at 3,036 ft. Total depth is 3,038 ft Wildcat operations in Butler County have expanded sharply. In addition to the completion of No. 1 Gardiner, there are 7 other wildcat operations in various stages of development.

Palmer Oil Co. 1 Neil, NW NW NW 20-9s-20w, Rooks County, has pipe set at 3,861 ft., 2 ft. in the Arbuckle, to test saturation logged in the top of the Arbuckle.

Dutton and Hicks 1 Steinle, SE SE SE 4-11s-12w, Russell County, has pipe set at 3,073 ft. Dodge was topped at 2,680 ft. and Lansing at 2,938 ft. A show of oil was logged at 16 to 28 ft. in the Kansas City. This test is located about 18 miles northeast of the Russell pool.

The Northwest Burnett pool, in the north part of Ellis County, with a noteworthy record of 10 maximum wells out of the first 11 completions since its discovery in January 1947, promises eventually to be an important extension of the old Burnett pool. Mid States Nos. 2, 3 and 4 now establish prolific production on a ½-mile front paralleling the present northwest side of the Burnett pool and there is nothing to indicate that the contact between the two pools may not be made on a much wider front.

Stanolind Oil & Gas Co is starting a test 1¼ miles east and ¼ mile north of its 1 Feathers, SW SW NE 15-35s-33w, Seward County, which is the deepest test ever completed in Kansas, having been drilled to 8,243 ft. and then completed as a gas well in Pennsylvanian, after being plugged back to 6,206 ft. The new test is 1 Matkins, SW NE NE 14-35s-33w.

KANSAS SUCCESSFUL WILDCAT

Butler County: Huber, Dunne & Strait 1 Garland, SW SE NW 15-28s-6e, produced 35 bbl. of 37.5°-gravity oil per day from Viola at 3,036-38 ft.; Topeka 1,695 ft., Lansing 1,995 ft., Kansas City 2,155 ft., Mississippi lime 2,659 ft., Basal Mississippian 2,948 ft., TD 3,038 ft.

KANSAS WILDCAT FAILURES

Barton County: Jones & Shelburne 1 Jenisch, NW NW NE 11-17s-12w, dry, TD 3,406 ft., anhydrite 780 ft., Topeka 2,775 ft., Kansas City 3,097 ft., Arbuckle 3,397 ft.

Graham County: Derby et al 1 Cox, SE SE NW 33-9s-21w, dry, TD 4,018 ft., Lansing-Kansas City 3,498 ft., conglomerate 3,806 ft., Arbuckle 3,884 ft.

Stafford County: Magnolia Petroleum 1 Garvin, SW SW SE 10-23s-13w, dry, TD 3,870 ft., Lansing-Kansas City 3,417 ft., conglomerate 3,744 ft., Viola 3,751 ft., Simpson 3,802 ft., Simpson 3,850 ft.

Woodson County: King et al 1 P. W. Hare, SW NW NE 32-25s-14e, dry, TD 1,460 ft., Mississippian 1,450 ft.

King et al 2 P. W. Hare, SW NW NE 32-25s-14e, dry, TD 685 ft., Kansas City 640 ft.

OKLAHOMA

Garvin County Getting Another Pool Opener

JAMES N. CROFTON 1 Loretta, SE SE SE 7-3n-1w, Garvin County, flowed 70 bbl. oil through ¼-in. choke on a 24-hour test, from perforations at 5,170-5,210 ft. in Bro-

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mide sand. Pipe is set on bottom at 5,283 ft. This test is about a mile east and ½ mile north of production in the East Antioch pool.

Carter Oil Co. 1 Bradshaw, NW SE 4-4n-3w, Garvin County, is drilling below 8,600 ft. Dense Bromide was logged at 8,503 ft. There were several encouraging shows in Pennsylvanian, the top of which was logged at 7,146 ft., the best show being at 7,270-95 ft. where drill-stem test showed 1,200,000 cu. ft. gas per day and recovered 30 ft of distillate and 30 ft. of oil and gas-cut mud.

Magnolia Petroleum Co. 1 Martin, NW NE 1-4n-4w, Garvin County, swabbed 33 bbl. oil in 10 hours, and flowed 14 bbl. in 12 hours from perforations in Bromide at 10,283-10,305 ft. Seven-in. pipe was set on bottom at 10,375 ft. Hunton was logged at 8,714 ft., Viola at 9,425 ft. and Bromide at 9,990 ft. The East Lindsay discovery well which this well offsets to the west, produces from Hunton.

Skelly Oil Co. et al 1 Woodmanse, NW NW NW 14-2s-4w, Stephens County, is testing on pump with 7-in. set at 3,982 ft., total depth 4,202 ft This test is about 1 mile northwest of production in the Milroy pool.

OKLAHOMA SUCCESSFUL WILDCATS

Caddo County: Grayhill Drilling Co. 1 Westelline, SW NE NE 34-6n-12w, bailed 1 to 2 bbl. of 29°-gravity oil per day from 760-84 ft.; lime 794-810 ft. with a stain of oil, TD 845 ft. (not a discovery).

Cotton County: Ross & Hamilton 1 Dugan, SW SE SW 5-5s-12w, pumped 50 bbl. of 38°-gravity oil per day from sand at 1,578-81 ft., TD 1,591 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: Nixon Petroleum Co. 1 Miller, NW NW SE 8-5s-12w, dry, TD 2,005 ft., sand 1,705-30 ft., Megargel 1,730 ft.

Garvin County: Gutowsky Brothers and O. H. Ledgerwood 1 Scott-Moore, NE NE NE 31-4n-1w, dry, TD 5,500 ft., Basal Pennsylvanian 4,900 ft., Viola 4,978 ft., brown lime 5,025 ft.

McElreath & Harvey 1 Barnett, NW NE SW 24-3n-1w, dry, TD 4,090 ft., lime 2,949-61 ft., sand 3,961-66 ft., 4,015-35 ft. and 4,043-50 ft.

Logan County: E. L. Gage and Claude Morgan 1 Dean, NW NW NE 7-15n-1e, dry, TD 5,786 ft., Bartlesville 5,130 ft.

Pawnee County: Kanotex Refining Co. and Raymond Gear 1 Whaley, NW NW SE 15-23n-5e, dry, TD 3,523 ft., Tonkawa sand 1,720 ft., Layton 2,060-2,170 ft., Cleveland 2,280-2,340 ft., Oswego 2,680 ft., Prue 2,865-80 ft., Skinner 2,920-30 ft., pink lime 2,950 ft., Red Fork 2,970-90 ft., Inola 2,990 ft., Bartlesville 3,015 ft., Mississippian 3,187-3,474 ft., dolomitic shale and sand 3,500-21 ft., Wilcox 3,511-23 ft.

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SOUTH LOUISIANA

New Cockfield Area Opened in Beauregard

NEW ORLEANS.—A new Cockfield producing area was opened in the northwest Juanita area of Beauregard Parish by Atlantic Refining Co. The discovery well is 1 Newport Industries Co., Inc. 11-5s-12w, 2 miles north-northwest of West Pinegrove production. Drilled to a total depth of 7,346 ft., 7-in. casing was set at 7,339 ft. and perforated at 7,272-78 ft. for an initial gage of 113 bbl. of 40°-plus gravity oil daily through a 6/64-in. choke. Flowing pressure was 1,040 lb. on the tubing.

A new test in Sohio Petroleum Co. and Union Sulphur Co., Inc. 1 Harson Unit "A," potential new field opener on the Scott-Duson prospect, Lafayette Parish, 5-10s-3w, showed salt water and has squeezed for another try. Drill-stem test was made using ¼ and ⅛-in. chokes through eight perforations at 10,750-52 ft. where it made a 100 per cent salt-water recovery. The test previously indicated a new field when it flowed gas and condensate with 3,500 lb. pressure from 10,840-56 ft. Total depth of the operation is 12,067 ft. where it hit a strong salt-water and gas flow while drilling.

The California Co. opened a new oil-producing horizon in Alliance field, Plaquemines Parish. The new oiler is 9 E. P. Brady, Lease 4, 19-16s-24e, 1,000 ft. northeasterly from 4 Brady discovery well. Potential gage was 89 bbl. of 38.1°-gravity oil daily through 6/64-in. choke with 975 lb. flowing pressure. Perforations in the new sand were from 9,252-57 ft. Total depth of the hole was 9,750 ft.

Three other new sands were opened to production in the past week. At Avery Island, Iberia Parish, Humble Oil & Refining Co. 13-B Petit Anse Co., Inc., 23-13s-5e, awaits potential gage after flowing at the rate of 324 bbl. of 35-gravity oil daily along with 262,000 cu. ft. gas daily from perforations at 10,310-60 ft. Total depth of the hole is 10,795 ft. The other two new producing levels were found in Leeville field of Lafourche Parish, by The Texas Co. The 102 LLE-Leeville, 22-21s-22e, produced 252 bbl. 33.3°-gravity oil daily through a 10/64-in. choke from 200 perforations at 8,300-50 ft., and the 103 LLE-Leeville gaged 227 bbl. of 35°-gravity oil daily through ⅛-in. choke from 120 perforations shot at 10,535-570 ft.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Lafourche Parish: New oil sand, Leeville field, Lafourche Parish—The Texas Co. 102 LLE-Leeville, 22-21s-22e, TD 8,637 ft., perf. 8,300-50 ft., 200 shots, IP 252 bbl. 33.3°-gravity oil 24 hours. 10/64-in. choke, TP 1,100 lb., gas-oil ratio 320 to 1, no water.

New oil sand, Leeville field, Lafourche Parish—The Texas Co. 103 LLE-Leeville, 28-21s-22e, TD 12,131 ft., perf. 10,535-70 ft., 120 shots, IP 227 bbl. 24 hours, ⅛-in. choke, 35° gravity, no water, TP 1,050 lb.

Plaquemines Parish: New oil sand, Alliance field, Plaquemines Parish — The

California Co. 9 E. P. Brady, Lse. 4, 19-6s-2w, TD 9,750 ft., perf. 9,252-57 ft., 30 shots, IP 89 bbl. in 24 hours, 6/64-in. choke, 38.1° gravity, TP 975 lb., 0.1 per cent water, gas-oil ratio 551 to 1.

SOUTH LOUISIANA WILDCAT FAILURES

Iberia Parish: Gulf Refining Co. 1 Marie Jeanminette, Grand Marias area, 8-13s-6e, 5 mi. N-NE Avery Island dome, dry, TD 9,011 ft.

Jefferson Parish: The California Co. 1 E. J. Bernstein, 2-16s-23e, 5,000 ft. NE of Delta Farms field production, dry, TD 11,291 ft.

St. Landry Parish: The Superior Oil Co. 1 J. J. Credeur et al, 30-8s-4e, 1¾ mi. S of Cankton field production, 2 mi. NE Boscoe field production, dry, TD 11,293 ft., had gas kick while drilling at 10,954 ft.

ROCKY MOUNTAIN

Frontier Sands Being Tested In Washakie County Well

DENVER.—Pure Oil Co. is testing Frontier sands in its 5 Unit, C SW NW 21-48n-92w, Worland dome, Washakie County, Wyoming, preliminary to completing in that horizon. Three wells heretofore completed on this structure out in the Big Horn Basin are producing from the Embar at a lower depth and this is the first to make a production test in the upper horizon, although the other wells had shows in the Frontier. Total depth of 5 Unit is 7,539 ft. Top of the first Frontier was at 7,143 ft., second, 7,247; third, 7,424 ft. Ground elevation is 3,989 ft The 7⅝-in. is cemented at 7,431 ft. A drill-stem test in the third Frontier at 7,426-49 ft., open 1 hour and 40 minutes, recovered gas in 4 minutes and 120 ft. of 52°-gravity distillate with estimated 3,000,000 to 4,000,000 cu. ft. of gas. The hole then was plugged back to 7,360 ft. to test the second Frontier. It was perforated with 320 holes at 7,288-7,320 ft., and 290 holes at 7,247-76 ft., and is being allowed to clean itself before gaging the production. In a previous drill-stem test in the second sand before running pipe it recovered 3,500,000 to 4,000,000 cu. ft. of gas with 4 bbl. of 66°-gravity distillate per hour, open 1 hour, at 7,253-55 ft.

Church Buttes—Mountain Fuel Supply Co. 3 Unit, NE SW NE 12-16n-113w, Church Buttes structure, Uinta County, Wyoming, 1½ miles west of the discovery, resumed coring at 12,952 ft., after making short tests, but is delayed at 12,960 ft. by stuck drill pipe. The 7-in. is at 12,944 ft. A short test through a ¼-in. choke in the 3⅞-in. drill pipe to test the casing shutoff resulted in an estimated flow of 12,800,000 cu. ft. of gas. A second test at 12,945-52 ft., open 20 minutes, recovered 20,000,000 cu. ft. of gas through a ¼-in. choke. This well is only 1½ miles east of the western boundary of the 50,000-acre unit. The 2 Unit, NE NE NE 22-17n-112w, Sweetwater County, 4¾ miles northeast of the discovery, attempted a drill-stem test, but after being open 30 minutes, the packer failed It is bottomed at 12,458 ft. and casing is at 12,445 ft.

Northwest Elk Basin.—Sinclair-Wyoming Oil Co. 1 Wilkins, NW SW NW 28-9s-23e, Northwest Elk Basin, Carbon County, Montana, is drilling ahead in its fault-block test northwest of Elk Basin field after encountering good shows in the second and third benches of the Frontier sand. It had the top of the second sand at 3,427 ft. In a drill-stem test at 3,426-76 ft., open 1 hour, gas was recovered in 4 minutes. Other recovery was 315 ft. of oil and 285 ft. of oil-cut mud. The gas was estimated at 775,000 cu. ft. Flowing pressure was 155 psi., and shutin pressure 1,125 psi. The oil is light, and approximately 50° gravity. Another drill-stem test at 3,611-42 ft., open 30 minutes, recovered 45 ft of mud. The

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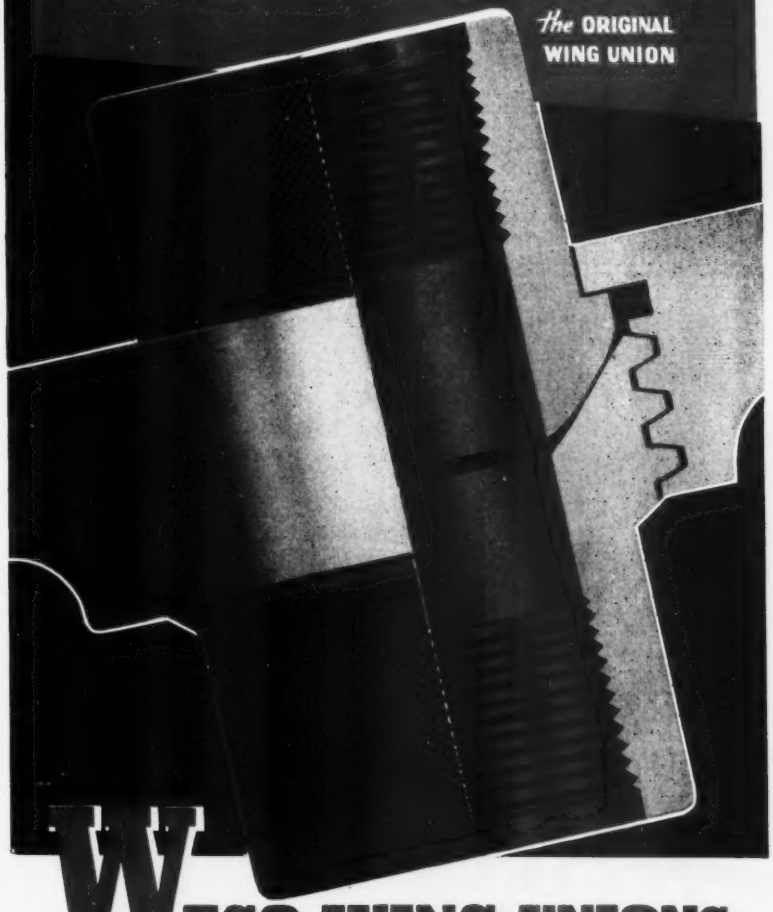

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Tensleep is the objective. Wells drilled to the southeast in the field proper indicate that the faults only extend down to the Dakota, showing only troughs at the bottom of that formation. The fault on the west, however, is estimated to have a down-throw of 2,000 ft.

Reagan Nose test.—Montana Power Co. 1 Tribal-355, SE SE SW 10-37n-7w, in the Blackfeet Indian Reservation, 1¾ miles south of the Canadian border, Glacier County, Montana, and a little more than a mile north of the Reagan discovery in the Madison, had the top of the lime at 3,694 ft., and shut off 12,000,000 cu. ft. of gas with the 5½-in at 3,744 ft. At 3,748 ft., total depth, it tested 1,000,000 cu. ft. of gas and 3 bbl. of oil and emulsion in 4 hours. It then was deepened to 3,757 ft. and tested 38 bbl. first 12 hours. The hole then began caving and was plugged back 10 ft. to run tubing for a squeeze job.

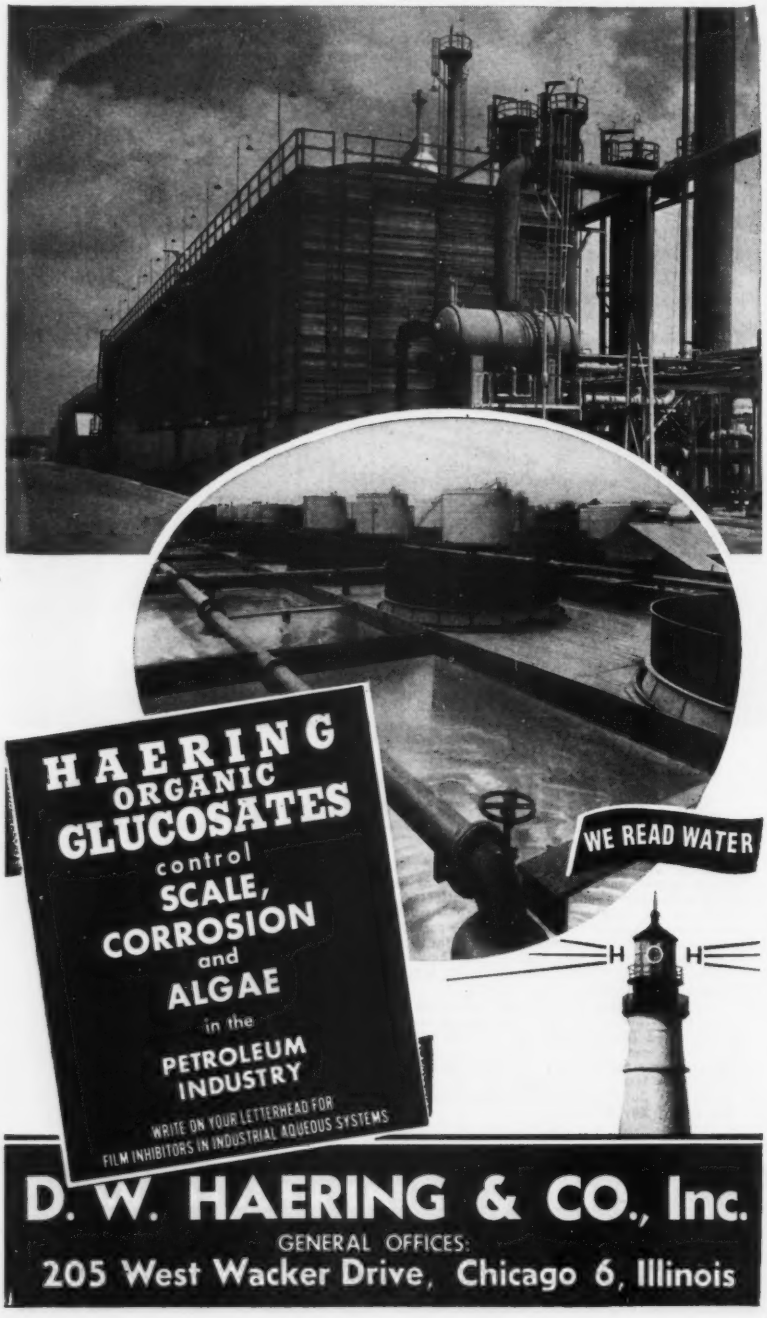
New operations.—Eighteen new operations were reported, of which two were in Colorado, nine in Wyoming, five in Montana, and two in northwestern New Mexico. Seven are wildcats. The two in Colorado are Rainbow Drilling Co. 1 Goff, C NW SE 2-3n-101w, South Skull Creek Moffat County, and Rainbow Drilling Co. 2 Capps, NW SE NW 12-28s-65w, Santa Clara District, Huerfano County. The South Skull Creek location is 4½ miles southeast of a well drilled in 1931 by William Myers which had the Weber at 1,960 ft. and was dry at 3,422 ft.

WYOMING SUCCESSFUL WILDCAT

South Fork, Washakie County: General Petroleum Corp. 88-24-G, SE SE SE 24-46n-92w, TD 10,900 ft., completed in Embar through perf. at 10,046-10,125 ft. for 202 bbl. 29°-gravity oil per day after acid, with total of 19,000 gal. Top Dinwoody 10,005, Embar 10,055, Tensleep 10,250, Amsden 10,480, Madison 10,716 ft., elev. 4,338 RB.

WYOMING WILDCAT FAILURE

Alkali Butte, Fremont County: Texas Co. 4 Unit, SW NE NW 1-33n-95w, TD 7,430 ft., salt water in Tensleep, plugged and abd. Top Frontier 2,810, Cloverly 4,240, Sundance 4,570, Embar 6,527, Tensleep 7,355 ft, elev. 5,625 RB.



OHIO, KENTUCKY

West Salem Station Gets Third Newburg Sand Well

COLUMBUS. — The third Newburg sand well was completed in the new West Salem Station pool in Congress Township, Wayne County, on G. W. Holland in Section 19. An unusually thick sand at 2,683-2,729 ft. had an open flow of 1,390,000 cu ft., which is a big well in this sand for Wayne County. The well was drilled to 2,731 ft. and tubed.

H. G. Bishop 2 F. E. Newton, Lot 6, north west Richfield Township, Summit County, found 15 ft. of pay in the white Clinton at 3,530-54 ft. with a natural open flow of 554,000 cu. ft. The well was drilled to 3,575 ft., shot, and shut in at a gage of 1,247,000 cu. ft. An offset to this well will be drilled to the south.

Preston Oil Co. 4 H R. Cook, Section 2, Bedford Township, Meigs County, had 15 ft. of good Berea sand at 1,545-60 ft. After the shot, the well flowed 33 bbl. in 22 hours.

A mile northeast extension to the Medina sand gas production in western York Township, Morgan County, was found by Ohio Fuel Gas Co. on completion of the 1 Thos. A. Fletcher, Section 25. Clinton sand at 3,861-98 ft. was dry and the Medina sand was reached at 3,981 ft. and drilled to 3,987 ft. where the gage was 504,000 cu. ft. natural.

EASTERN KENTUCKY

ASHLAND.—Four counties in this area accounted for six completions for the week, all brought in by the West Virginia Gas Co. In Knott County, the company completed No. 5718 on the Lee Hull property at 2,125 ft. for 967,000 cu. ft. of gas in Big lime, and No. 5517 on the William Hall property, dry at 2,085 ft. Pike County accounted for two gassers: No. 841 Perry Cline, total depth 3,300 ft., 189,000 cu. ft. of gas in shale, A.S., and 5668 Mitalda Clark at 3,270 ft. with 198,000 cu. ft. of gas in lime. In Martin County, 5727 Adam Crum was bottomed at 1,144 ft. for 232,000 cu. ft. of gas in the Maxon, and 842 Woodloe Howard, in Magoffin County, was dry at 2,472 ft.

WESTERN KENTUCKY

OWENSBORO.—C. E. O'Neal & Co. 1 B. Fellows, 16-O-23, Henderson County, recovered 45 ft. clean oil, 65 ft. of mud-cut oil and no water on a drill-stem test at 1,741-49 ft. in the Waltersburg sand. Total depth is 1,749 ft. This test is about 1 mile west of the nearest production in Cairo pool.

WESTERN KENTUCKY WILDCAT FAILURE

Butler County: W. B. Phillips 2 C. Grise, 23-H-32, dry at 412 ft., Viola 248 ft., upper Glen Dean 302 ft., Hardinsburg 390 ft.

INDIANA

EVANSVILLE.—C. A. Lynch is drilling plug in 1 P. Fleener, NW SE SW 22-3s-12w, Gibson County, to test Waltersburg sand logged at 1,872-80 ft. Total depth is 1,880 ft.

Pumping test is being made on Texas Co. 1 Golden, NE NW SE 19-5s-13w, Posey County. On swabbing test the well made 70 bbl. oil per day from Waltersburg sand at 2,116-26 ft. Total depth is 2,126 ft.

CANADIAN FIELDS

Deepened Test in Leduc Starts Flowing

CHATHAM.—In Leduc field, southwest of Edmonton, Imperial-Leduc 3, LSD 10, 26-50-26w4, after striking a small gas flow in the Devonian limestone was deepened, and started flowing by heads. The well, 2 miles northeast of the discovery, is being finished in Devonian lime at 5,313 ft., with 7-in. casing run to 5,297 ft. to shut off between 250,000 and 500,000 cu. ft. of gas. No estimates have been given on oil production, but a larger well than Imperial-Leduc 1 is indicated.

McColl-Frontenac Oil Co., holding a large reservation south of the Leduc field and near Wetaskiwin, is spudding 3-22, LSD 3, 22-46-23w4, south and east of Leduc field. Equipment is arriving for McColl-Frontenas 1-20, LSD 1, 20-46-26w4, to the southwest of the field.

Jumping Pound.—In Jumping Pound field, in the southern Alberta foothills west of Calgary, Shell 5-7-1, which made about 1,000,000 cu. ft. of wet gas from a 30-ft. upper porous zone in the Madison, has resumed at 9,860 ft., deepening through dense limestone to another porous zone expected around 9,930 ft. Plans are being considered to deepen one of the Shell tests into this area to the underlying Devonian limestone, which would involve an ultimate depth around 12,000 ft.

Lloydminster.—In the Alberta section of Lloydminster field, Superior 4, SW 6, 14-50-2w4, finished at 1,986 ft. with lower Cretaceous section, Command-Globe 7, SE 8, 15-47-27w3, finished at 1,873 ft., got lower Cretaceous at 1,682 ft. and oil sand at 1,847 ft. Gateway 1, NW 14, 35-48-28w3, total depth 1,913 ft., got lower Cretaceous at 1,739 ft. and oil sand at 1,899 ft. Van Lloyd 4, NW 2, 2-49-28w3, has finished at 1,897 ft. with lower Cretaceous at 1,705 ft. and oil sand at 1,873 ft. Two wells are drilling and two rigging with one new location. Highwood-Lloyd 1, SW 11, 13-48-28w3, which had flush of 75 bbl. settled to pumping production of 50 bbl. Saskatchewan production from the field was 23,523 bbl. in April, increased from 20,759 bbl. in March; Alberta production was slightly increased at 10,117 bbl. The field has 25 Saskatchewan and 17 Alberta producing wells.

APPALACHIAN FIELD

Chestnut Ridge Gas Well Improved by Deepening

PITTSBURGH.—On Chestnut Ridge in Georges Township, Fayette County, southwest Pennsylvania, with 2,500,000 cu. ft. gas from the Oriskany sand in No. 1 W. M. Hartman, which is the south offset to No. 1 Smith, the large Onondaga chert gas well, Peoples Natural Gas Co. continued drilling from 7,629 ft. to 7,637 ft. where the tools passed through a hard shell. There was a sudden increase in gas, estimated at 10,000,000 cu. ft. which bumped the tools up the hole where they lodged. Line was whipped off and it is completed at that depth with final gage of 6,000,000 cu. ft. when shut in, and a rock pressure of 1,600 psi. which was still increasing. To the north, the offset of Manufacturers Light & Heat Co. No. 1 Jesse S. Eutsey is drilling through the Onondaga chert and from 6,939 ft. where the gage showed 2,500,000 cu. ft. gas per day, it increased to a high of 4,200,000 cu. ft. and is now 3,200,000 cu. ft. The gas is turned in the line when not drilling.

On Briery anticline in Portland district, Preston County, West Virginia, Wm. E. Snee, Orville Eberly et al logged the Tully lime in the test Cora E. Lewis at 4,630-40

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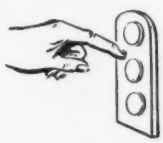

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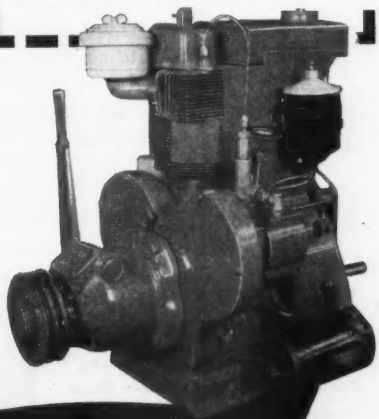

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ft., or —2,635-45 ft., which is much higher on structure than the chert discovery well, No. 3 Harrison Sisler where the Tully was topped at —2,859 ft. Unless a fault intervenes, this test will attract considerable interest, as both No. 2 and No. 3 are good wells.

In Lincoln district, Wayne County, United Fuel Gas Co. in No. 5,734 Huntington Development & Gas Co. struck 5 bbl. a day in the Big Lime, total depth 1,560 ft., and will acidize. It is in gas territory.

In Freemans Creek district, Lewis County, Hope Natural Gas Co. completed a good Gantz gas well in No. 9,109 M. B. Riley which gaged 3,965,000 cu. ft. from a total depth of 2,240 ft.

In Clear Fork district, Raleigh County, Hope Natural Gas Co. completed 9,116 Joseph Chambers with a final gage of 1,212,000 cu. ft. gas per day from the Ravencliff sand, 1,630-68 ft., gas 1,649-68 ft., rock pressure 440 psi. in 16 hours, total depth 1,669 ft.

In Nuttall district, Fayette County, the wildcat on Columbian Carbon Co., on Franklin Real Estate Co. tract, which has been standing, has resumed drilling at 2,800 ft. and will be carried down as a deep test.

ILLINOIS

Cypress Sand Discovery In Edwards County

MATTOON.—Inland Producers, Inc., 1 Gilbert Harms, SE SE NE 19-1s-14w, Edwards County, recovered gas in 29 minutes, and 1,980 ft clean oil free of water, on a drill-stem test in Cypress sand at 2,706-19 ft. The well is now below 2,900 ft. and will test McClosky lime. Upper Menard was logged at 2,231 ft., Waltersburg at 2,327 ft., Viola at 2,376 ft., Golconda at 2,588 ft., and Cypress at 2,712 ft. Nearest production in the Albion pool is about 1½ miles to the south.

Ashland Oil & Refining Co. 1 Smith, SW NW NE 21-3n-7e, Clay County, had gas in 8 minutes and flowed clean oil in 52 minutes on drill-stem test of McClosky lime at 2,952-74 ft. Total depth is 2,974 ft. Casing is being run. A successful completion will give the Sailor Springs pool an extension to the south.

ILLINOIS WILDCAT FAILURES

Bond County: Joe Kesl 1 Huber, NW NW SW 22-6n-4w, dry at 1,939 ft., Devonian 1,893 ft.

A. Wilson 1 File, SE SW NE 21-5n-4w, dry at 700 ft., no log.

Clark County: C. Fitzgerald 1 Geff, NW SE SW 28-12n-13w, dry at 750 ft., no log.

Clay County: W. O. Laswell-W. F. Creager 1 Ruger, NE SW NW 34-3n-7e, dry at 3,041 ft., Glen Dean 2,461 ft., Barlow 2,632 ft., Ste. Genevieve 2,970 ft

Edgar County: F. Scales 1 W. A. Doss, SW SW NW 36-14n-13w, dry at 159 ft., sand 157-59 ft., small show of oil.

Jefferson County: Nash Redwine 1 Meadows, SE SE NW 15-3s-4e, dry at 3,200 ft., Glen Dean 2,410 ft., Cypress 2,690 ft., Ste. Genevieve 3,023, McClosky 3,087 ft.

Puritan Drilling Co. 1 Woodsworth, NW NW SE 27-2s-4e, dry at 3,111 ft., Glen Dean 2,440 ft., Cypress 2,724 ft., Ste Genevieve 3,007 ft., McClosky 3,087 ft.

Lawrence County: Arvin Drilling Co. 1 Martin, NE SW NE 7-2n-12w, dry at 2,345 ft., Glen Dean 1,755 ft., Cypress 1,972 ft., Rosiclare 2,275 ft., St. Louis 2,338 ft.

Madison County: Luttrell et al 1 Steinkolong, NW SW NW 35-4n-6w, dry at 1,900 ft., Ste. Genevieve 937 ft., Devonian 1,878 ft., Silurian 1,888 ft.

Marion County: Paul Doran et al 1 Copple-Mulvaney, SW NE NE 16-3n-4e, dry at 2,570 ft., Menard 1,744 ft, Benoist 2,287 ft., McClosky 2,490 ft.

Homer Lutrell 3 Krug, SW SW NE 1-4n-3e, dry at 2,350 ft.

Montgomery County: Joe Reznik 1 Monke, NE NE SE 4-7n-5w, dry at 2,595 ft., Devonian 1,786 ft., Trenton 2,487 ft.

SUMMARY OF APRIL COMPLETIONS

	Comp.	Oil	Prod.	Gas	Dry	Under 1,000 ft.	1,000-2,500 ft.	2,500-5,000 ft.	5,000-10,000 ft.	Over 10,000 ft.	Total footage	Rigs and drilling
New York	86	43	107	0	[1]43	0	86	0	0	0	123,992	131
Pennsylvania	235	120	264	17	[2]98	0	0	235	0	0	355,179	223
West Virginia	52	7	30	37	8	0	27	18	7	0	159,243	158
Ohio	109	27	474	42	[3]40	10	39	60	0	0	308,851	229
Indiana	57	19	1,086	2	36	8	39	10	0	0	108,450	54
Kentucky	61	25	1,627	6	30	17	27	17	0	0	106,781	48
Illinois	120	70	5,764	0	50	3	25	92	0	0	274,002	151
Michigan	40	16	3,633	1	[4]23	0	22	18	0	0	95,592	120
Kansas	158	82	37,608	26	[5]50	0	13	142	3	0	517,762	304
Neb., Mo., Iowa	0	0	0	0	0	0	0	0	0	0	0	13
Oklahoma	279	[6]140	18,973	15	[1]124	12	108	119	39	1	878,220	514
Texas	663	435	85,589	23	205	47	156	237	210	13	2,976,146	1,018
North	160	94	7,867	1	[5]65	27	71	48	14	0	425,786	224
West Central	54	28	2,316	2	24	0	22	28	4	0	166,289	59
West	150	131	53,084	2	17	8	25	61	50	6	725,245	163
Panhandle	21	15	2,698	5	1	0	2	14	5	0	78,304	133
Eastern	44	17	2,812	[6]6	[2]21	0	4	14	26	0	237,271	101
Gulf Coast	118	[5]79	9,460	4	35	0	2	21	90	5	755,974	188
Southwest	116	[6]71	7,352	3	42	12	30	51	21	2	587,277	150
Louisiana	87	53	7,253	3	31	3	25	20	25	14	526,950	167
Northern	43	[7]21	1,754	3	19	3	22	12	5	1	137,017	46
Southern	44	[8]32	5,499	0	12	0	3	8	20	13	389,933	121
Arkansas	18	8	1,191	1	9	0	3	10	5	0	79,255	33
Mississippi	30	[9]20	5,619	[3]3	7	0	0	0	12	18	274,244	99
Ala., Ga., Fla.	2	0	0	0	2	0	1	0	0	1	17,570	15
Montana	14	10	869	1	3	1	7	5	1	0	32,544	47
Wyoming	15	10	2,412	1	4	0	0	10	5	0	73,352	69
Colorado-Utah	15	12	2,648	0	3	2	0	1	12	0	81,972	62
New Mexico	37	31	15,911	3	3	1	5	12	19	0	180,894	94
California	145	119	29,713	4	22	3	31	58	47	6	638,071	248
Total April	2,223	1,247	220,771	185	791	107	614	1,064	385	53	7,809,070	3,797
Total March	2,443	1,358	216,978	267	818	107	859	1,003	416	58	8,760,626	3,714

Service wells: [1]43, [2]96, [3]1, [4]3, [5]2. Distillate wells: [6]1, [7]2, [8]4.

CALIFORNIA

Prospective Extension For Cymric Field

LOS ANGELES. — Rothchild - Bender Oil Operations has evidently uncovered an extension of the Cymric field with its Kern County wildcat, the 8 Sheep Springs, 17-29s-21e. Although no production tests have been made, the well is reported to have cored the Carneros formation from 3,636-3,910 ft. and also to have encountered saturation in the Oceanic oil sand which was topped at 4,820 ft. The well is now at a total depth of 4,885 ft. and has been experiencing considerable difficulty in controlling gas since reaching that depth. Latest trouble occurred when gas broke out from behind the casing and developed fissures as far as 100 ft. from the well. The well was killed with mud, but drill pipe became stuck and crews are now engaged in fishing operations. Prior to this latest demonstration the well blew out while tools were being pulled. No trouble was experienced in killing the well, however.

If the 8 Sheep Springs can be controlled successfully and brought into production, it will mark up an important extension to the Cymric field. It is located approximately 1½ miles northwest of the nearest producing wells in the field.

Shell Oil Co.'s apparent deep discovery in the Long Beach field, the 2 Dolley, 29-4s-12w, is still bottomed at 10,119 ft and having difficulty in securing an effective water shut-off. The 7-in. shoe has been re-cemented for the second time, and crews are retesting to determine whether or not the shut-off is successful.

Two of the state's most interesting exploratory ventures, both in the Del Valle area, continued drilling ahead during the past week. Standard of California 1 Boobier, 15-4n-17w, Ventura County, is drilling ahead at 7,262 ft., and has been credited with several favorable shows to the present depth. The well is located north and east of structural faulting, and successful completion at this site would mark the first development of production on this side of an east-west trending fault.

Meanwhile, in Section 16-4n-17w, Russel E. Havenstrite is drilling ahead below 11,637 ft. in his deep wildcat, the 15 Lincoln. This well has already found an extensive deep zone at 10,140 ft., but Havenstrite is placing no evaluation on this or any other showings encountered so far until conventional tests can be made. The 15 Lincoln is located southeast of faulting. Both north-south and east-west faulting are known to exist in the area being explored by Standard and Havenstrite.

Union Oil Co. has undertaken a new venture in the Newhall mountain area, where the company has had production for nearly 37 years. The new test, which has already spudded, is known as the 4 Canada de la Brea, and it is located on the Rancho Simi in 32-3n-18w, Ventura County. It will be an effort to locate deeper oil-bearing sands Union has found some oil shows in exploratory holes in this area in recent years, but nothing of commercial importance has been turned up. Possibilities of new Miocene production, however, are considered better than average.

New locations during the past week continued about normal with a total of 38 new tests announced. This was an increase of four over the previous week. Wilmington again took the lead in development, receiving eight of the projected tests, while Cymric placed second with four.

CALIFORNIA SUCCESSFUL WILDCATS

Orange County, West Newport Area: Amerada Petroleum Corp. 45-7 Holtz, pumped 357 bbl. per day, 16.5° gravity, 0.1 cut, 7-in. casing 5,435 ft., TD 5,550 ft.

Ventura County, West Mountain Area: Ring Oil Co., Synd. 1 S. P., 23-3n-21w, pumped 110 bbl per day, 20.8° gravity, 50.0 cut, 7-in. casing 3,758 ft., TD 5,592 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Kern River Area: Seaboard Oil Co. 4 Fuhrman, 21-28s-28e, dry in gray sand, elev. 969 ft., Vedder 3,368 ft., TD 3,406 ft.

Lost Hills Area: Richfield Oil Corp. 1 Frank Buck, 6-27s-21e, dry, elev. 455 ft., TD 7,720 ft.

McKittrick Area: E. A. Parkford 1 Parkford-McKittrick, 22-30s-22e, dry, elev. 939 ft., TD 7,732 ft.

Midway-Sunset Area: General Petroleum Corp. 77-17 Frankley, 17-11n-23w, dry, elev. 874 ft., TD 5,019 ft.

Poso Creek Area: Independent Exploration Co. 1 Williams, 31-27s-28e, dry in gray sand, elev. 596 ft., Vedder 2,781 ft., TD 2,808 ft.

Orange County, Placentia Area: Royalty Service Corp. 1 H. B., 36-3s-10w, dry, TD 6,406 ft.

West Newport Area: Republic Operators, Inc., 1 Terrace Comm., 16-6s-10w, dry in gray sand, elev. 95 ft., TD 4,486 ft.

Yolo County, Dunnigan Hills Area: The Texas Co 2 Dunnigan Unit One, 2-11n-1w, dry, elev. 193 ft., TD 4,000 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR. Bureau of Land Management, Washington, 25, D. C. Notice is hereby given that sealed bids will be received until 1 P.M., Wednesday, June 25, 1947, for the SW¼NE¼, N½NW¼SE¼ sec. 32, T. 12 N., R. 23 W., S.B.M., 60 acres, situated within the known geologic structure of the Sunset field, California. This land is offered to qualified bidders of the highest cash amount per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act of February 25, 1920 (41 Stat. 437, 30 U.S.C. sec. 181) as amended. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil, and 12½ per cent to 16 2/3 per cent for gas, in accordance with Schedule B in the lease form. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., and each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check on a solvent bank, or by money order, made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.42(b) and (c). The envelopes should be plainly marked, "Bid for lease, Sunset field, California. Not to be opened before 1 P.M., June 25, 1947." No bids received after the hour fixed herein for submitting bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a corporate surety bond in the sum of $1000 must be furnished by a successful bidder prior to the issuance of a lease. A $5000 corporate surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bid. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Fred W. Johnson, Director.

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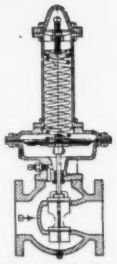

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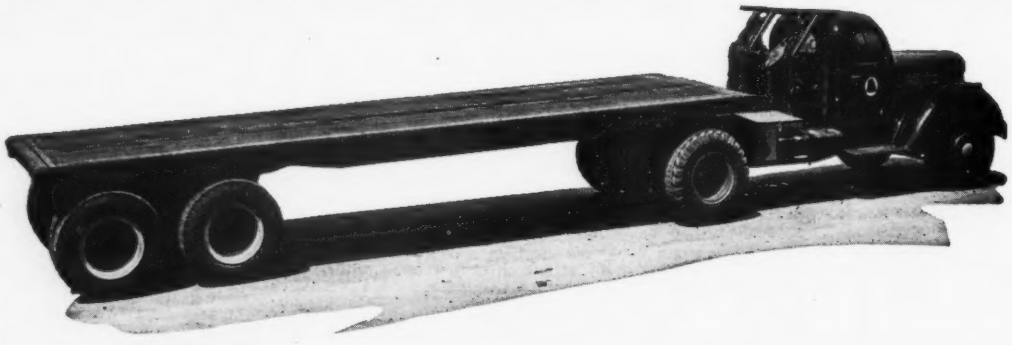

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Active Rotary Rigs Show Slight Increase for April

A slight increase in the number of rotary drilling rigs active in April as compared with May is shown by figures released by the Interstate Oil Compact Commission. Most of the increase was accounted for by activity in the Rocky Mountains and the West Texas, New Mexico and North Texas area. Oklahoma showed the greatest decrease with 11 fewer rigs active in April. A breakdown of active rotary drilling rigs by areas is as follows:

Area—	March	April
Pacific Coast	142	142
Kansas	105	105
Oklahoma	191	180
Rocky Mountains (including Western Canada)	82	91
North Louisiana, E. Texas and Arkansas	146	150
West Texas, New Mexico and North Texas	396	404
Illinois Area (includes Ill., Ind., Ky., Mich.)	82	500
Gulf Coast (includes southeast United States)	493	500

Drilling Permits Issued for Five Michigan Wildcats

Five wildcats are included in recent drilling permits issued in Michigan. **I. F. Scott** has the contract for the Ervin Major 2 John Heltzel, SW NE NW 26-19n-3e, Arenac County, 6 miles southeast of Freer deep well. **Arenac Oil & Gas Co.** will drill the J. O. Mutch 1 Alonzo Simcox and W. Lombard, C N½ NW 14-10n-3w, Gratiot County, 2 miles south and 2 miles west of Ithaca.

The third wildcat, the L. C. Green 1 Sonnevil, NW NE SW 10-2s-12w, Kalamazoo County, will be under contract to **Stuart L. Godfrey** and is 14 miles southeast of Bloomingdale field. **Leslie T. Barber** is contractor for the L. T. Barber 1 W. A. Thompson et al, SW NE NW 20-11n-7w, Montcalm County. This test is located on 40 acres where a well drilled in 1938 produced 1,000,000 cu. ft. of gas per day from the Stray. **C. W. Kendall** has the contract for the J. H. Fitchett 1 C. C. Cook, SE SE SW 27-1s-14w, Van Buren County, 3 miles southeast of Bloomingdale field.

West Central Drilling Co., Dallas, has started drilling on a wildcat, its 1 J. W. Snyder, a 3,500-ft. rotary test 330 ft. from north and west lines of east half of northeast quarter, Section 30, D&DA Survey, south of Avoca, Jones County, Texas.

1,700 Men Trained in Field Vocational Classes

Field vocational classes in drilling muds, sponsored by the American Association of Oilwell Drilling Contractors, Texas State Board of Vocational Education, the New Mexico State Board for Vocational Education, and University of Texas, have trained a total of nearly 1,700 men to date.

Courses are currently being conducted at Raymondville, Tex.; Eunice, N. M., and Holdenville, Okla. Courses at Hobbs, N. M., and Three Rivers and Angleton, Tex., were recently completed. At Evansville, Ind., Kermit and Monaghans, Tex., and nine drilling centers in South Louisiana, the courses are scheduled to extend into the autumn months.

These classes have been running 2 weeks each, 5 days per week, with sessions held both morning and evening, so that men working any tour may participate. The courses cover the use of chemicals in mud, all standard mud tests, control of viscosity, weight, pH, water loss, etc., and are open to roughnecks, drillers, tool pushers, engineers, or anyone who can profit by this type of training.

Regent Drilling Co., of Calgary, is contractor for Globe-Leduc 1, to be drilled in the new Leduc field southwest of Edmonton. Drilling depth will be somewhat below 5,000 ft.

Shaw Petroleums, of Lloydminster, Alta., is completing Dimsdale 2, SW 2, 14-50-2w4, in the northwest extension of Lloydminster field.

Evans & Sons, of Tillsonburg, Ont., have contract for a deep test for Imperial Oil on the W. Coristine farm in Brook Township, south of Watford. It is expected the test will be carried through the Trenton limestone.

Northern Development Co., of Edmonton, Alta., is finishing Lloydminster 14, LSD 14, 24-49-29w3 and starting Manners 2, SW 10, 35-48-28w3, both in the Saskatchewan section of Lloydminster field. The same com-

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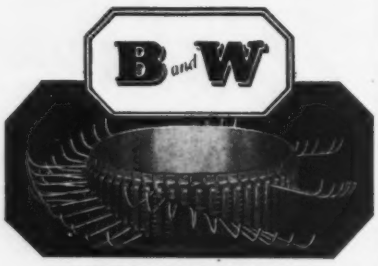

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pany has contract for Globe-Leduc 2, NE 34-50-26w4 in the new Leduc field southwest of Edmonton.

Trinity Drilling Co., Dallas, has staked location for its 2 Weatherly, 660 ft. from north and west lines, 21-21-37, Lea County, New Mexico. This well is a north outpost to Drinkard pool in southeast Lea County.

Parker Drilling Co., Tulsa, is the contractor for Gulf Refining Co. 1 State of Florida-363, 22-62s-38e, in the Florida Keys, Monroe County, Florida.

Triangle Drilling Co., Shreveport, is moving in material at its 1 Fisher, a wildcat in SW SW 10-14n-15w, 2 miles north of Keatchie, DeSoto Parish, North Louisiana.

Falcon Seaboard Drilling Co., Tulsa, is planning a 5,200-ft. test, the 1 Judkins, SE SE SW 30-14n-4e, Lincoln County, Oklahoma.

Ashby Bros. Drilling Co., East St. Louis, Ill., has brought in an oiler in Daviess County, Kentucky, its 2 Hamilton, 7-O-27, for 30 bbl. per day oil and 30 salt water.

B. M. Heath, Carmi, Ill., has set surface pipe for the Farm Bureau 1 Sanford Vail, NW NW NW 6-6s-13w, Posey County, Indiana.

Summit Drilling Co., Tulsa, is rigging up for its 2 Whitson, CSL NW SW 16-11-15, Russell County, Kansas.

Wheless Drilling Co., Houston, is moving in rotary for a Travis Peak wildcat, the C. H. Murphy, Jr., 1 W. C. Agurs, 660 ft. from north and west lines of fractional 7-16n-16w, Caddo Parish, Louisiana. This test is 3 miles southeast of Waskom production and 4 miles south of Stanolind Oil & Gas Co. 1 Fred Wampler which extended Waskom wet-gas production from Harrison County, Texas, 2 miles into Louisiana.

Justrite Drilling Co. is moving in to drill its 1 Oliphant, NE NE SW 18-9n-9e, Gilcrease pool, Hughes County, Oklahoma.

Harbar Drilling Co., Wichita, is drilling a wildcat in northwestern Oklahoma for J. M. Huber Corp. et al, the 1 Hieronymous, C NW SE 3-26n-24w, near Lavern in Harper County. Contract is for 7,200 ft. or the Mississippi lime.

Graham Powell Drilling Co., Centralia, Ill., is staking a location for the Gulf Refining 2 F. C. Shelton, SW SE NE 4-3s-4e, Jefferson County, Illinois.

Martin Harris Drilling Co. is contractor for S. J. Felsenthal 1 W. E. Bradley, near center of a 113-acre tract, Land Lot 522, Second Military District, about 10 miles northwest of Baxley, Appling County, Georgia. Contract is for the Paleozoic, expected around 4,100 ft.

Iron Drilling Co., Tulsa, has started on two wells of its own in Hughes County, Oklahoma. They are the 2 Weaver, C W½ SE NE 10-6n-8e, a 2,725-ft. test, and the 1 Weaver, C E½ SE NE 10-6n-8e.

McDaniel & Beecherl Drilling Co., Dallas, has filed application to drill its 1 Radford Grocer Co., 660 ft. from north and east lines of N½ NE¼ Section 76, Block H, D&W Survey, Gaines County, Texas. This wildcat will drill to around 5,700 ft. with rotary to test the San Andres-Permian. The test is near the center of a large Phillips Petroleum Co. block and the acreage was procured by McDaniel & Beecherl on a farmout.

Taylor & Kirby, Kilgore, Tex., have contract for R. K. and R. P. Scrivner 1 J. W. Jones, a 3,500-ft. test in Fannin County, Texas, about 4½ miles northwest of Honey Grove.

Derby Drilling Co., Wichita, has completed a producer in the Brandenstein pool, western Rice County, Kansas, for 545 bbl. of oil from the Kansas City. The well is the 1 Behnke, NE NE NE 15-19-10.

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MIDGET No. 1—1 swivel, ¼" chain
DEI-TA No. 1—1 swivel, ⅜ or ½" chain
DIXIE No. 1—2 swivels, ⅜ or ½" chain
LONE STAR 1—2 swivels, ⅜, ½ or ⅝" chain
LONE STAR 2—2 swivels, ½, ⅝ or ¾" chain

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Gutowsky Brothers Drilling Co., Oklahoma City, has contract for Ace Gutowsky 1 Smith, C NE NE 36-25n-6w, south of Pond Creek in southern Grant County, Oklahoma. This wildcat is located on a Sinclair Prairie Oil Co. lease concentration and will drill to 5,500 ft. or the Prue sand.

R. W. Rine Drilling Co. is planning to move its offices from Great Bend, Kans., to the Central Building, Wichita.

Hall-Miller Drilling Co. has staked location for its 1 Wapskinch, SW NE SE 28-7n-4e, Pottawatomie County, Oklahoma.

Hewgley Drilling Co., San Antonio, has moved in rotary rig at Plymouth Oil Co. 1 D. L. Alford, eastern Upton County, Texas, wildcat. When drilled originally in 1942, the well was dry at 10,384 ft. in the Devonian. Plymouth resumed drilling in 1946 and plugged back to 9,734 ft. Present plans call for deepening to the Ellenburger which the operators expect around 11,000 ft. The new operation is reported to be a joint venture by Slick Oil Co., Charles F. Urschel, Sr., C. W. Chancellor, and Hewgley Drilling Co.

Fred Morgan, Oklahoma City, is drilling a 6,500-ft. test 3 miles north of Katie pool, Garvin County, Oklahoma, for Tom Potter, Dallas. The well is the 1 Bonner, C SW SW 16-2n-1w.

Royer-Farris Drilling Co., Wichita, and J. P. Quigley are scheduled to drill a wildcat 17 miles northwest of the Morel pool, Graham County, Kansas. This test, the 1 Kate Jackson, NE NE NE 2-8-23, is 1½ miles north of Hill City. Skelly Oil Co. and Sunray Oil Corp. are supporting.

Winn-Beck have the contract for a wildcat for John C. Powell, the 1 Jobe Murray, SE SW NE 32-4n-1w, Fayette County, Illinois.

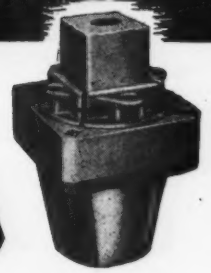
Beebe, Berry Drilling Co. et al, Wewoka, Okla., has filed intention to drill the 1 Clark, SW SW NE 21-8n-9e, a 3,600-ft. test, Hughes County, Oklahoma.

Kiowa Drilling Co., Wichita, has brought in a producer for Solar Oil Co., the 1 Tammen, SW SW SW, 24-19-16, Rush County, Kansas. This wildcat flowed an estimated 100 bbl. of oil per day.

Puritan Drilling Co. is rigging up rotary for its 1 Everett Alka, NE SE NW 35-2n-13w, Wabash County, Illinois.

Hayes Drilling Co., Mt. Carmel, Ill., has hit the pay at 2,953 ft. in its wildcat, 1 Harrell-Hunley Comm., NW NE NW 35-4n-9e, Richland County, Illinois. A drill-stem test got a flow of oil in 8 minutes.

DRIVING TORQUE CUSHIONED WITH



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Bushing Body is a solid, one piece unit with a corrugated inner core. An oil resistant synthetic rubber cushion absorbs the shock of drilling torque. Bushing is equipped with four slips inside the rubber cushion, faced with liners made of anti-friction material. These liners take all the wear and are reversible for long economical life. Ask the BJ man or see your supplier.

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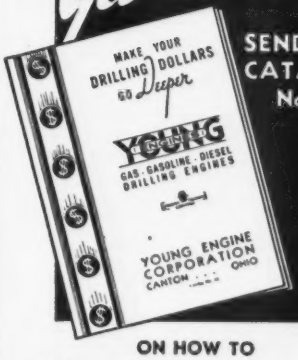

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STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 24, 1947

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	21	10	0	*11	30,324	490	618	0	0	0	0	0	3	0	0	2	5
Pennsylvania	61	30	8	†23	92,193	1,190	1,589	0	0	0	0	0	0	0	0	0	0
West Virginia	16	5	10	1	30,631	303	274	0	0	0	0	0	0	0	1	0	1
Ohio	23	2	15	6	64,611	484	450	0	0	0	0	0	0	0	3	19	22
Indiana	11	6	0	5	16,724	219	126	0	0	0	0	0	6	0	0	17	23
Kentucky	21	8	4	†9	27,515	217	175	0	0	0	1	1	5	0	0	20	25
Illinois	42	20	0	22	104,436	726	827	0	0	0	12	12	19	0	0	110	129
Michigan	20	3	9	8	41,816	255	287	0	0	1	5	6	5	0	7	79	91
Kansas	56	31	9	§16	177,956	971	775	1	0	0	5	6	15	0	9	112	136
Neb., Mo., Iowa	0	0	0	0	0	2	7	0	0	0	0	0	0	0	0	2	2
Oklahoma	59	40	6	13	178,851	1,547	918	2	0	0	5	7	31	2	6	267	306
Texas	165	113	10	42	752,408	3,299	3,185	6	3	4	20	33	117	22	31	489	659
North Central (Dist. 7B & 9)	49	30	4	‡15	154,892	1,020	1,123	1	0	2	5	8	42	0	7	161	210
West (Dist. 7C & 8)	38	30	0	8	172,165	792	666	0	0	0	4	4	11	0	2	61	74
Panhandle (Dist. 10)	13	11	1	1	39,653	166	142	0	0	0	0	0	1	0	1	0	2
Eastern (Dist. 5 & 6)	6	5	0	1	32,364	191	305	0	0	0	0	0	3	0	2	43	48
Gulf Coast (Dist. 3)	31	15	5	11	193,788	613	724	0	3	2	8	13	29	15	13	104	161
Southwest (Dist. 1, 2, & 4)	28	22	0	6	159,546	517	225	5	0	0	3	8	31	7	6	120	164
Louisiana	36	25	2	9	233,832	471	529	3	0	1	6	10	15	8	4	64	91
Northern	18	10	2	6	68,107	236	284	0	0	1	3	4	0	0	1	37	38
Southern	18	15	0	3	165,725	235	245	3	0	0	3	6	15	8	3	27	53
Arkansas	8	5	0	3	29,811	97	72	0	0	0	3	3	0	0	0	18	18
Mississippi	16	13	0	3	137,924	159	93	0	0	0	2	2	0	0	1	31	32
Southeastern States	1	0	0	1	4,637	17	18	0	0	0	1	1	0	0	0	15	15
Montana	3	1	2	0	5,657	68	101	0	0	0	0	0	1	0	0	10	11
Wyoming	3	2	0	1	21,347	79	65	1	0	0	1	2	7	0	2	13	22
Colorado-Utah	0	0	0	0	0	62	49	0	0	0	0	0	1	0	0	12	13
New Mexico	11	8	2	1	50,505	197	148	0	0	0	0	0	4	0	1	13	18
California	41	29	1	11	178,029	778	721	2	0	0	8	10	19	0	2	113	134
Total United States	614	351	78	185	2,179,207	11,631	¶11,027	15	3	6	69	93	248	32	67	1,406	1,753
Total previous week	561	323	53	185	1,916,182	11,017	10,473	10	2	3	65	80	233	29	61	1,337	1,660
Total May 25, 1946	543	309	45	189	1,774,982			9	3	3	66	81	198	22	46	1,243	1,509

Service wells included: *11, †22, ‡1, §2. ¶Revised.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.40	....	....	....
19-19.9	1.45	....	....	....
20-20.9	1.49	$1.55	....	$1.42
21-21.9	1.53	1.57	....	1.44
22-22.9	1.57	1.59	....	1.46
23-23.9	1.60	1.61	....	1.48
24-24.9	1.64	1.63	$1.86	1.50
25-25.9	1.68	1.65	1.88	1.52
26-26.9	1.71	1.67	1.90	1.54
27-27.9	1.75	1.69	1.92	1.56
28-28.9	1.79	1.71	1.94	1.58
29-29.9	1.82	1.73	1.96	1.60
30-30.9	1.86	1.75	1.98	1.62
31-31.9	....	1.77	2.00	1.64
32-32.9	....	1.79	2.02	1.66
33-33.9	....	1.81	2.04	1.68
34-34.9	....	1.83	2.06	1.70
35-35.9	....	1.85	2.08	1.72
36-36.9	....	1.87	2.10	1.74
37-37.9	....	1.89	2.12	1.76
38-38.9	....	1.91	2.14	1.78
39-39.9	....	1.93	2.16	1.80
40 and above	....	1.95	2.18	1.82

*For crude from Laboval, El Campo, and Sandy Point. †Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED MAY 17

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosene	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosene	Gas & dist. oil	Residual
East Coast	839	1,976	328	943	1,844	22,006	4,754	9,251	7,157
Appalachian:									
District 1	99	300	42	98	85	2,554	195	391	245
District 2	72	239	21	47	134	1,135	56	114	107
Ind., Ill., Ky.	764	2,614	316	798	993	20,143	1,340	2,873	2,246
Okla., Kans., Mo.	422	1,472	195	466	467	9,323	402	1,225	996
Inland Texas	197	751	72	115	366	4,069	233	319	610
Texas Gulf	1,072	3,206	702	1,502	1,438	13,963	1,641	5,818	5,112
Louisiana Gulf	360	1,058	340	526	438	5,213	828	2,007	1,019
N. La. and Ark.	65	164	47	67	95	1,979	229	381	110
Rocky Mountain:									
New Mexico	11	41	4	10	19	83	17	42	43
Other	129	422	17	154	198	2,967	68	501	622
California	837	2,279	53	936	2,140	16,358	823	10,922	26,123
May 17, 1947	4,867	14,522	2,137	5,662	8,217	99,793	10,586	33,844	44,390
May 10, 1947	4,840	14,351	1,921	5,514	8,224	100,394	10,152	33,363	42,875
May 18, 1946	4,747	14,163	1,963	5,492	8,199	96,206	11,969	33,108	41,512

*Finished and unfinished. †At refineries including natural blend.

Bureau of Mines crude-oil stocks 237,303,000 bbl. as of May 17—up 803,000 bbl. One year ago 222,113,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.	
East Texas	$1.95
Kettleman Hills, California*	1.94
Beauregard Parish	1.90
Illinois Basin	2.07
Pecos County, Texas (Yates)	1.65
Bradford, Pennsylvania	4.05
Eastern Ill. and Western Ind.†	2.07
Tomball, Texas Gulf Coast	2.10

*37°-37.9°. †35° and above.

TRENDS

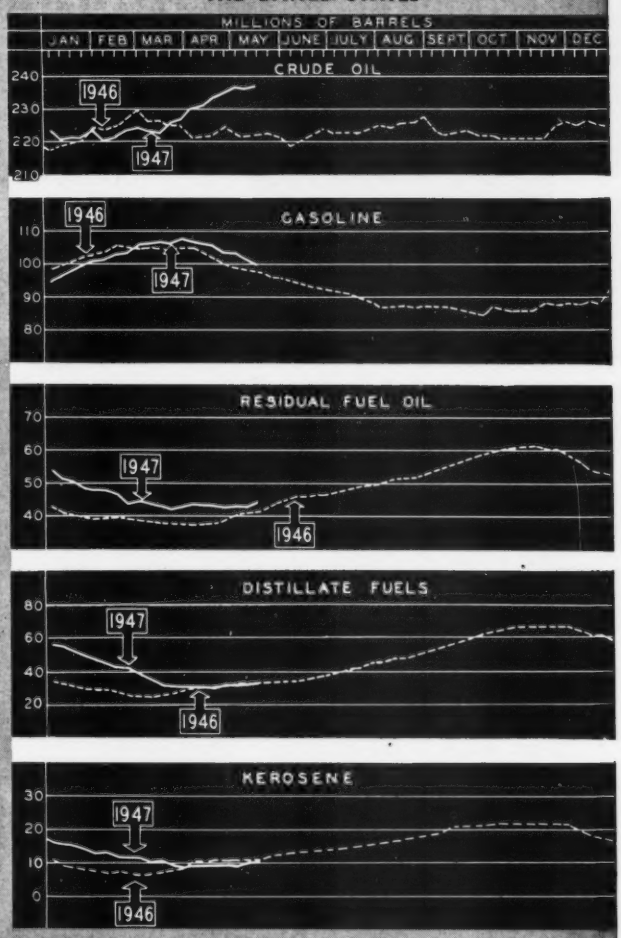
DAILY AVERAGE PRODUCTION FOR WEEK

	May 24 crude oil	B. of M. May demand	May 17 crude oil
Alabama	1,050	1,200	1,100
Arkansas	79,750	79,000	80,050
California	924,800	875,000	913,000
Colorado	39,040	39,000	39,920
Eastern	66,000	65,200	64,000
Florida	475	300	475
Illinois	185,800	210,000	186,300
Indiana	17,500	18,000	17,900
Kansas	287,900	275,000	286,450
Kentucky	25,200	29,000	25,900
Louisiana	420,500	411,000	420,700
North Louisiana	104,500	.....	104,700
South Louisiana	316,000	.....	316,000
Michigan	45,690	47,000	42,030
Mississippi	91,100	86,000	87,900
Montana	22,840	24,000	22,910
Nebraska	600	700	600
New Mexico	105,350	102,000	105,350
Oklahoma	387,000	380,000	385,750
Texas	2,226,850	2,120,000	2,226,850
Dist. 1 (Southwest)	21,100	.....	21,100
Dist. 2 (Southwest)	159,160	.....	159,160
Dist. 4 (Southwest)	243,415	.....	243,415
Dist. 3 (Gulf Coast)	485,170	.....	485,170
Dist. 5 (Eastern)	38,360	.....	38,360
Dist. 6 (Eastern)	112,500	.....	112,500
East Texas field	338,000	.....	338,000
Dist. 7C (West)	36,795	.....	36,795
Dist. 8 (West)	530,125	.....	530,125
Dist. 7B (W. Central)	38,200	.....	38,200
Dist. 9 (N. Central)	137,800	.....	137,800
Dist. 10 (Panhandle)	86,225	.....	86,225
Wyoming	114,300	108,000	114,930
Miscellaneous		600	
Total United States	*5,041,745	4,871,000	5,022,115
Change from prev. wk., up	19,630		

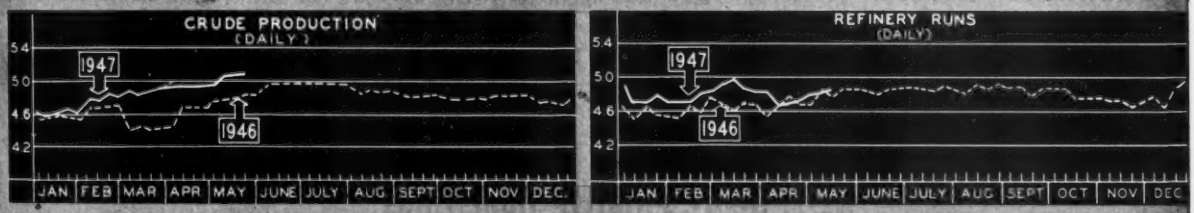
Total production January 1-May 24 ..... †700,311,305 bbl.
Same period last year (crude plus cond.) . 677,884,989 bbl.

*Not incl. 34,450 bbl. condensate. †Incl. 3,974,000 bbl. condensate.

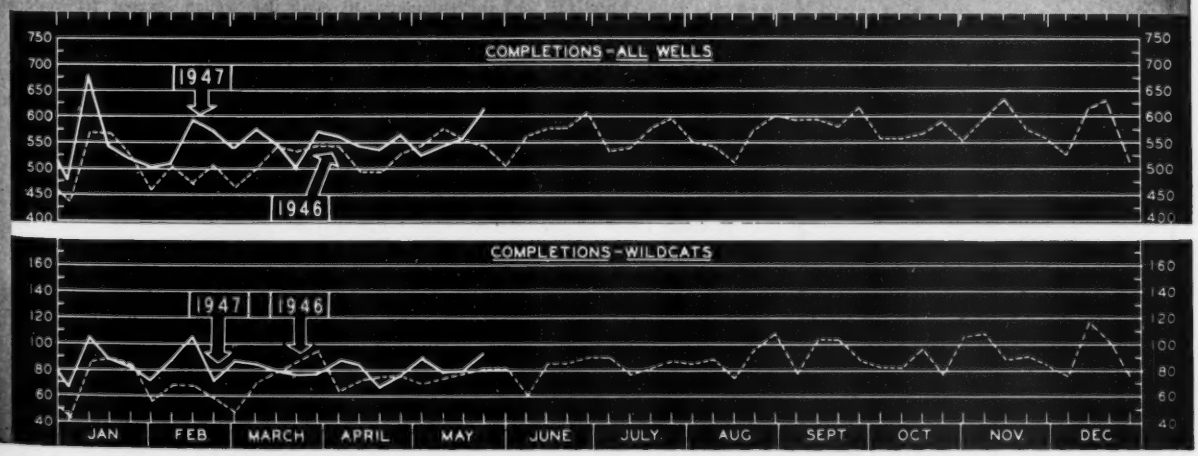
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included.



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(Specification ASTM A-106-Grade B)

Total Feet Available	O.D.	Average Wall	Price per 100 Feet
915	5 9/16"	.950"	$300.00
2585	5 9/16"	.789"	258.00
2475	6 5/8"	.996"	384.00
1470	8 5/8"	1.237"	658.00
780	10 3/4"	1.443"	966.00

Average Lengths Available

Item #1—18 to 24 ft. Item #3—18 to 22 ft.
Item #2—17 to 24 ft. Item #4—13 to 24 ft.
Item #5—20 to 24 ft.

TERMS:

1/2% 10 Days — Net 30
F.O.B. Cudahy, Wis.

$25.00 charge on lots of less than 250 feet on an individual item.

All offerings subject to prior sale.

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(Milwaukee Suburb)

MARKETS

NO. 6 fuel oil, which has been climbing steadily in price, has failed for the first time in several weeks to show an advance. Supplies still were short throughout the country and approaching the critical state on the West Coast, but demand was less urgent.

The steel industry, which has been the most eager purchaser of No. 6 in recent weeks, was reported past the critical-shortage state and slackening its demand for standby fuel. Price was still variable, with sales reported from a minimum of $1.79 a barrel to a top of $2.45. One independent refiner was quoting $2.50, but no shipments at that price had been reported.

All other petroleum products were tight, with premiums being paid for material in many Mid-Continent transactions. Gasoline was particularly tight, with some 80-octane aviation gas moving at 10¾ to 11. Sale of third-grade gasoline at 7¾ and 7⅞ also was reported.

Sales Refused

One independent Mid-Continent refiner continued refusing sales except on old contracts, declaring his plants' production of all products was lagging behind demand. Natural gasoline was reported exceptionally tight, with a shortage of tank cars hampering operations.

Demand for butane was off, due to an April-August seasonal slump, but the market was stabilized to some extent by northern and eastern natural-gas distributing companies, which were reported installing large butane-storage systems for standby purposes in domestic distribution systems.

Some refiners were reported storing kerosene, while buying No. 1, in the expectation of a huge demand for kerosene during the autumn and winter months.

In New York the gasoline situation continued tight, with one supplier increasing his premium grade posting 0.2 cent and his regular grade 0.3 cent. Other suppliers indicated they will follow suit.

Navy Needing Fuel

On the West Coast the fuel-oil shortage was reported critical, with utility companies, the U. S. Navy, and manufacturing concerns unable to obtain commitments for their future requirements. The Navy was reported able to obtain commitments for only 60 per cent of its second-quarter needs, and spokesmen previously have declared foreign operations will have to be curtailed unless more oil becomes available.

In the Pacific Northwest, utility companies were believed able to obtain commitments for less than half of their fuel-oil needs for the year beginning July 1.

Causes given for the shortage included: heavy reduction of West Coast petroleum stocks during the war; a 75 per cent increase in fuel-oil demand; reduction in available gas supplies; deficit water year resulting in reduced hydroelectric-power potential.

In Kansas Gov. Frank Carlson warned farmers of a threatened shortage of fuel during the coming harvest season and advised them to fill all possible storage space in order to ease the critical situation expected to develop as the harvest gets under way.

Representative Quotations

Representative spot-market quotations of leading suppliers as of last Monday. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel.

GASOLINE, KEROSENE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	8-8.5	10.1-10.4* 9.2-9.4†	8.5-8.75
Premium gasoline, 78-80 octane	8.75-9.5	10.2-12	9-9.5
42-44 w.w. kerosene	6.875-7.25	7.8	6.875-7.125
No. 2 straw fuel oil	6.125-6.625	6.8-6.9	5.75-6
No. 6 residual	$1.79-2.45	$2.22	$1.80-2.00

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.375	4.875*	5.125
Grade 18-55	6.45	5.85	6.15

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	11-12.5
750 vis., No. 3-4 neutral	13-15.25
2,000 No. 5-6 neutral	14.5-16.75

LUBRICATING OILS

Mid-Continent

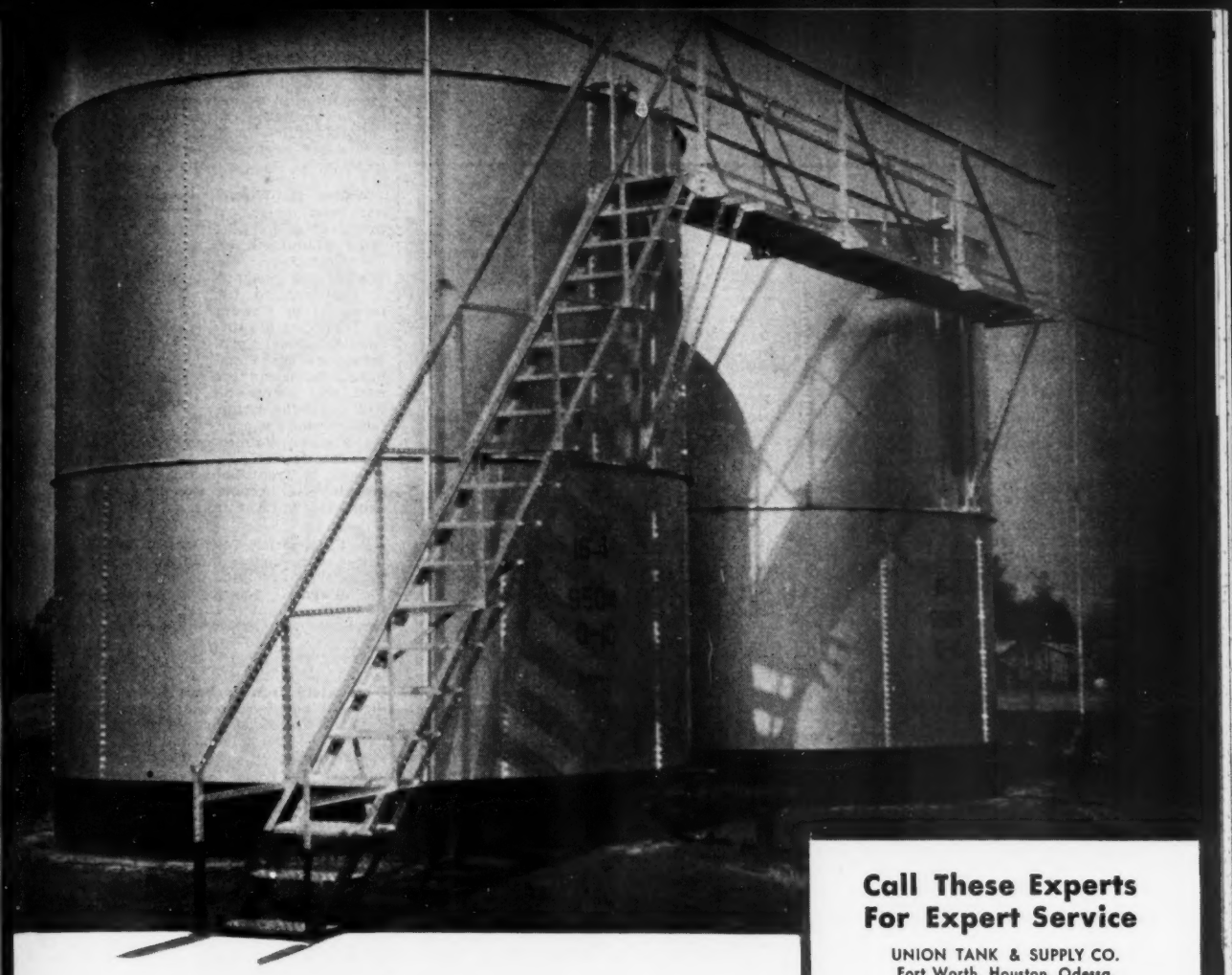
150-160 vis. D bright stock, 0-10 p.p.	29
200 vis. No. 3 neutral, 0-10 p.p.	18-20

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	39-40
180 vis. 0 p.t. neutral	42

CRUDE-SCALE WAX

130-132 A.S.T.M. melting point	7.75



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BOLTED TANKS • WALKWAYS • STAIRWAYS • UNIT HEATERS

Equipment Men in the News

Charles Spitzfaden, Jr., has been made an assistant district manager in charge of Kansas operations of Continental Supply Co.,

C. SPITZFADEN, JR.

W. R. GOTTSHALL

with headquarters in Wichita. He joined the company in 1937, serving as a machinery salesman in Oklahoma. His most recent position has been as assistant manager of machinery sales in the Tulsa area. **William R. Gottshall,** until recently assistant manager of tubular sales for the Oklahoma-Kansas district, has been appointed an assistant district manager with headquarters in Oklahoma City. He will be in charge of the company's Oklahoma subdistrict. Gottshall has been with Continental since 1936.

Tuboscope Co. has announced the appointment of **C. R. (Red) O'Dell** as manager of its West Texas division with headquarters at Odessa, replacing **C. E. Luna,** who is on leave of absence from the company.

W. A. (Red) Davis announces the formation of Davis-Lynch Sales & Engineering Co. The new company will serve as manufacturers' agents, handling the Superior oil and gas separator manufactured by Superior Tank and Construction Co. and representing the oil field division of Lebus Rotary Tool Works. Present location of the company is at Katy and Post Oak roads, Houston.

David C. Peterson, former industrial consultant, has been appointed director of engineering and research at the main Chicago plant of Stewart-Warner Corp. Formerly Peterson has been actively engaged for 6 years as an industrial consultant to several large diesel engine manufacturers, working on various phases of engineering and production.

American Car & Foundry Co. announces that **Justus W. Lehr** has been appointed district manager in charge of the A.C.F. Berwick, Pa., plant, succeeding **Guy C. Beishline,** who recently resigned.

M-C-M Machine Works, Oklahoma City, announces the purchase of Sun Oil Filter Co., Oklahoma City, and will immediately take over the manufacture and distribution of the Sun Oil Filter.

Continental Supply Co., Dallas, has announced several recent changes in store personnel. **C. H. Boles** has been appointed manager of the Sundown, Tex., store, succeeding **V. H. Von Der Lin.** The latter has been named field salesman at Odessa, Tex. **Lloyd Viator** is now manager of the company's New Iberia, La., store. He succeeds **E. S. Snyder** who has resigned.

After almost 25 years of service, **M. A. Stanton,** branch manager at International Harvester's Buffalo motor-truck branch, has been retired. **W. G. Schendel,** formerly assistant manager at Buffalo, has been promoted to branch manager to succeed Stanton. **G. D. Partridge,** formerly assistant manager at Cleveland motor-truck branch, has been promoted to branch manager at Baltimore motor-truck branch, replacing **B. M. Kaiser,** recently appointed southwest district manager. **J. W. Young,** formerly assistant manager at Philadelphia motor-truck branch, has been transferred to Cleveland in the same capacity.

Ivan L. Nixon and **Ben A. Ramaker** were recently elected vice presidents of Bausch & Lomb Optical Co. at a meeting of directors following the firm's annual meeting of stockholders. Reelected were: **M. Herbert Eisenhart,** president; **Joseph F. Taylor,** vice president and treasurer; **Carl L. Bausch, Theodore B. Drescher,** and **Carl S. Hallauer,** vice presidents; and **Edmond S. La Rose,** controller.

Robert C. Ledford has resigned as chief engineer of California Refining Co., Barber, N. J., to accept a position as Oklahoma distributor for the Plibrico Jointless Firebrick Co., Chicago. Ledford will take over the Plibrico Sales & Service Co. located at 531 West Main Street, Oklahoma City, which was formerly operated by **L. R. Land,** recently retired.

John M. Bastion has been appointed Goodyear Tire & Rubber Export Co.'s sales representative, with headquarters in San Francisco. Bastion will be in charge of the company's complete line of export items, including tires, tubes, mechanical goods, and chemical and shoe products.

Fred S. Crook has been appointed district engineer of the St. Louis territory of Elgin Softener Corp., Elgin, Ill. The territory includes eastern Missouri, southern Illinois, and western Kentucky. Crook will retain the present St. Louis headquarters in the Paul Brown Building.

L. W. Rodolf, manager of the Gardner-Denver Co. branch office in El Paso for 28 years, has been appointed manager of the San Francisco branch office. **F. R. McNamara** has been appointed new manager of the El Paso office. McNamara formerly was a company representative in the Philippine Islands.

At a stockholders' meeting held at Graemere Hotel in Chicago, the corporate name of Galvin Manufacturing Corp., makers of Motorola home and car radios and Motorola car heaters, was officially changed to Motorola, Inc., effective May 15.

Walter H. Wiewel has been elected president of Trent Tube Manufacturing Co., East Troy, Wis. Wiewel has resigned as assistant to the president of National Tube Co., a United States Steel Corp. subsidiary in Pittsburgh, to accept his new post where he will direct the manufacture and sale of its line of stainless steel tubing. **F. E. Elge,** the founder and developer of Trent Tube Co., has resigned as president to become executive vice president. He will continue as a director.

W. H. WIEWEL

B. F. Goodrich Co. plans an expansion of tire-manufacturing facilities at its Miami, Okla., plant involving in excess of $1,000,000. The increased facilities would boost production approximately 16 per cent over the current output and would provide employment for about 150 to 200 additional workers.

Mountain Iron & Supply Co. announces the opening of a store at Plainville, Rooks County, Kansas. Other stores are at Russell, Chase, McPherson, and Madison, Kans. The company's main offices are at Parkersburg, W. Va.

B. M. Kaiser has been named Southwest district manager of motor trucks of International Harvester Co. **J. T. Sullivan,** formerly district manager, Southwest district, has been transferred to the Eastern district in the same capacity.

W. E. Curran has been named general manager of Rheem Manufacturing Co. He is also a vice president and director. Joining Rheem in 1942, Curran was made vice president in charge of production in 1943, and in February 1946 was elected a director. He will continue to make his headquarters in New York.

Cameron Iron Works sales and field service men met recently at their Houston headquarters for a 3-day conference. The men in the picture are: front row—Herbert Allen, Madden Works, Bill Collins, George E. Myers, Carl R. Griffith, Raymond C. Buchanan. Middle row—Sydney S. Raimer, Alford A. O'Connor, William Roy Davis, Ivey E. "Fox" Moses, Morey Zorgdrager, Xavier R. Showers, Atlee D. Cathey, Jack W. Harris, J. R. Jerabeck, Joseph A. Tennant, Jr., Carnie L. Potts, Frank H. Isaacks, Robert F. Farmer, Edmond L. Lorehn, Ruric N. "Roy" Bean, H. G. "Jeff" Musolf, Homer E. Brown. Top row—Richard W. Gustine, Adolph L. Scharck, Frank M. Allen, Robert W. Gunsalus, Willie R. Price, George N. Moughon, Douglas V. Clemons, Judson J. "Doc" McCann, Charles W. Giraud